# Health Systems Resilience Index

## A Sub-National Analysis of India's COVID-19 Response

**Mona and Debosmita Sarkar**

Soumya Bhowmick, Renita D'Souza, Nilanjan Ghosh, and Oommen C. Kurian

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Attribution: Mona and Debosmita Sarkar, et al., *Health Systems Resilience Index: A Sub-National Analysis of India's COVID-19 Response*, July 2022, Observer Research Foundation.

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ISBN: 978-93-90494-51-4
ISBN Digital: 978-93-90494-42-2

# Abbreviations

| | |
|---|---|
| AI and ML | Artificial Intelligence and Machine Learning |
| ANM | Auxiliary Nurse Midwife |
| ASHA | Accredited Social Health Activist |
| AYUSH | Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy |
| BE | Budget Estimate |
| CBNAAT | Cartridge based Nucleic Acid Amplification Test |
| CHC | Community Health Centre |
| DCCC | Dedicated COVID-19 Care Centre |
| DCH | Dedicated COVID-19 Hospital |
| DCHC | Dedicated COVID-19 Health Centre |
| DH | District Hospital |
| FLW | Front Line Worker |
| FY | Financial Year |
| GBD | Global Burden of Disease |
| GIS | Geographical Information System |
| GPS | Global Positioning System |
| HCW | Health Care Worker |
| HDU | High Dependency Unit |
| HSRI | Health Systems Resilience Index |
| HWC | Health and Wellness Centre |
| ICMR | Indian Council of Medical Research |
| ICU | Intensive Care Unit |
| IVRS | Interactive Voice Response System |
| INR | Indian National Rupees |
| LAC - ADF | Legislative Assembly Constituency - Asset Development Fund |
| LMO | Liquid Medical Oxygen |
| MBBS | Bachelor of Medicine Bachelor of Surgery |
| MoHFW | Ministry of Health and Family Welfare |

| | |
|---|---|
| NCD | Non-Communicable Disease |
| N/S DMA | National/State Disaster Management Authority |
| NFHS | National Family Health Survey |
| NGO | Non-Governmental Organization |
| NHM | National Health Mission |
| NHP | National Health Profile |
| NICU | Neonatal Intensive Care Unit |
| NPO | Non-Profit Organization |
| OOPE | Out-of-Pocket Expenditure |
| PHC | Primary Health Centre |
| PPE | Personal Protective Equipment |
| PSA | Pressure Swing Adsorption |
| RT PCR | Reverse Transcriptase Polymerase Chain Reaction |
| SARS-CoV-2 | Severe Acute Respiratory Syndrome Coronavirus 2 |
| SDG | Sustainable Development Goal |
| SDH | Sub-District Hospital |
| SDRF | State Disaster Relief Fund |
| UT | Union Territory |
| WHO | World Health Organization |

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# Foreword

There is no better time than now to invest in health systems. More than two years since the outbreak of COVID-19, societies and economies across the globe are still straining from the impacts of the pandemic. Even the big economies that were presumed to have well-equipped healthcare systems were rendered helpless by a virus that was determined to reach every territory across the globe. We all re-learnt a lesson we had archived in the recesses of our minds: that health security and protecting life must continue to be not only a central state policy, but our societal obsession, too. Equally crucial, we were taught that to manage a health crisis of the magnitude of COVID-19, we must nurture effective and objective emergency communication, adaptive socio-economic behaviour, and the ability to mobilise and deploy resources. For all of this, political and social leadership remains an imperative.

In India, a healthcare delivery system that has historically suffered from ad-hoc regulation, poor monitoring, and modest budgetary allocations, needed to be streamlined rapidly to fight the pandemic. Some states and union territories (UTs) succeeded more than others. For those who did, the key was aligning their health systems with the needs of the population. Today, as the world sees a likely future of recurring infections, state leaders will need to prioritise the building of knowledge systems and investment in human capital and critical infrastructure, and to put into place robust evaluative mechanisms. This will need an across-the-board consensus for action.

This ORF report presents a sub-national analysis of India's health system, which takes into account both the tangible and intangible assets at the state level against the backdrop of the pandemic. This pioneering Health Systems

Resilience Index is composed of five sub-indices that use 33 indicators covering quantifiable aspects of the resources and governance mechanisms that were available to, and were wielded by India's states and UTs. Utilising publicly available data from various government sources, this report gives a clear view of how the states and UTs fared during the 2020 and 2021 waves of COVID-19; while the report ranks states and UTs on the basis of their performance, the aim is to offer a data-driven examination of the gaps in the system that can be addressed to mitigate future crises. This is the time to learn, and more importantly, the time to learn from each other across state boundaries even as we invest in global knowledge and response networks.

As unprecedented as the COVID-19 crisis has been, it will not be the last. We are required to strengthen our health systems and make them harmonious, equitable, and sustainable. It would do us well to start doing this now.

Let me congratulate the lead authors and the ORF research team that have worked on this report. I am sure it will offer valuable inputs to policymakers and to others studying the pandemic.

Dr Samir Saran
President, ORF
July 2022

# Executive Summary

## 1. Introduction

India's COVID-19 battle will be told and retold in the coming years, inspiring both praise for what the country has achieved, and critique for its shortfalls. As India's story continues to unfold, two strands will mould the various assessments. First is India's aggregate performance as a developing economy: It marshalled its meagre resources to respond to the exponential threat of the virus, and was determined, too, to be part of global solutions to this scourge, such as the manufacture and supply of life-saving vaccines. The second, and perhaps even more important story is on ground-zero: In its cities and villages, India's success or failure would be a factor of the leadership and stewardship of Prime Minister Narendra Modi and his team in responding to the crisis, and the commitment of the chief ministers and state functionaries to beef up their health systems and save lives.

Whichever way the India story is told, there are certain truths that cannot be hidden: We need to invest more in our health systems, and acknowledge the stellar role of our frontline workers and formal and informal health sector personnel, as well as India's prowess in certain segments of the medical and health industry.

In this context, it becomes interesting to see how in the country's federal structure (where health is a State subject), the sub-national units—i.e., states and union territories (UTs)—have performed. The present work,

*Health Systems Resilience Index: A Sub-National Analysis of India's COVID-19 Response,* provides answers to that question. It builds on an earlier report published by the Observer Research Foundation in May 2020. That report, *State of the States: Two Months of the Pandemic,* evaluated India's initial response to the pandemic shortly after the crisis was officially named by the World Health Organization (WHO). Two years since then, this report attempts a more ambitious goal: to devise a unique Resilience Index for the health systems of India's states and UTs.

## 2. About the Report

The report has two distinct components presenting the state of health systems on the basis of various parameters and reports on the resilience of such systems. It begins with a presentation of individual states and UTs' health profiles, in the context of the pandemic, using publicly available data. All data variables considered for this study were collated from Government of India sources and are available in the public domain. Not a single data has been sourced from a non-governmental origin. On the basis of government data, the report presents a new composite index—one that encapsulates a comprehensive evaluation of the level of resilience of each state and UT that considers the COVID-19 pandemic as a "stress test" for health systems.

## 3. The Health Systems Resilience Index (HSRI)

### 3.1. Motivation and need for a composite index for health systems resilience

The prolonged COVID-19 pandemic has served as a "stress test" for India's health systems. Did those systems pass the stress test, or did they fail? More importantly, have those systems been strengthened since, in order for them to become more resilient in the event of subsequent waves of COVID-19 or another health crisis of similar magnitude? These are the key questions that needed to be answered as current health policy literature has not attempted to do so.

It needs to be kept in mind that Health is a State Subject. The Union Government's role is largely prescriptive by way of policy and drug control. However, a disaster of the scale such as that of the pandemic required the Union Government to invoke the Disaster Management Act 2005 and the Epidemic Diseases Act 2020 to intervene.

Yet, that does not take away the responsibilities of the sub-national entities, their initial infrastructure and endowments, and their responses to the outbreak of COVID-19, especially during the disastrous first and second waves.

### 3.2. Methodology and Data Sources

The index was developed using 33 component indicators, classified into five broad parameters or sub-indices, namely: general health profile; medical infrastructure; technology infrastructure; institutional support; and COVID-19-related health outcomes (see Table ES1). Therefore, the composite index is a combination of initial conditions that are reflective of the health preparedness of a sub-national unit, the response mechanism to the pandemic, and the final outcomes. In another sense, the index is a combination of static variables (those under General Health Profile, Medical Infrastructure, Technology Infrastructure, and the two revenue expenditure variables under institutional support, and the vaccine doses, tests, deaths, peak daily case load under COVID-19 related health outcomes) and dynamic variables (the two related to revenue change under institutional support, and the time taken between the highest peak of daily cases to its 20 percent, time taken between peak positivity rate to fall below 5 percent, days taken to reach benchmark vaccination coverage of 18+ population, and weeks taken to reach benchmark vaccination coverage of 60+ population under COVID-19-related Health Outcomes.)

## TABLE ES1: SUB-INDICES, INDICATORS, AND THEIR DATA SOURCES

| Sub-Index | Indicators | Data Source |
|---|---|---|
| 1. General Health Profile | 1.1. Households with any usual member covered under a health insurance/financing scheme (%) | NFHS 5 (2019) |
| | 1.2. Children age 12-23 months fully vaccinated based on information from either vaccination card or mother's recall (%) | NFHS 5 (2019) |
| | 1.3. Monthly per capita out-of-pocket expenditure on health as a share of Monthly Per capita Consumption Expenditure (%). | SDG INDEX 2020, NITI Aayog, Government of India |
| | 1.4. Prevalence of NCDs per 100,000 population | Global Burden of Disease Study - India Compare (2019) |

| | | | |
|---|---|---|---|
| 2. | Medical Infrastructure | 2.1. No. of Physicians, Nurses, midwives per 10,000 population | SDG 3 Index 2020, NITI Aayog, Government of India |
| | | 2.2. Registered Pharmacists in the State per 10,000 population | National Health Profile 2020 |
| | | 2.3. COVID-19 Testing Labs per 10,000 population | ICMR, dated: 18th August 2021 |
| | | 2.4. COVID-19 Sample Collection Centres per 10,000 population | ICMR, dated: 18th August 2021 |
| | | 2.5. Covid Beds per 10,000 population | Various sources include state NHM/HFWD/COVID-19 Dashboards, dated: August 2021 |
| | | 2.6. Dedicated Covid Hospitals (DCHs) per 10,000 population | Lok Sabha unstarred question no. 952, dated: 16th September 2020 |
| | | 2.7. Dedicated Covid Health Centre (DCHC) per 10,000 population | Lok Sabha unstarred question no. 952, dated: 16th September 2020 |
| | | 2.8. Dedicated Covid Care Centre (CCC) per 10,000 population | Lok Sabha unstarred question no. 952, dated: 16th September 2020 |
| | | 2.9. Vaccination Sites per 10,000 population | CoWIN DASHBOARD |
| | | 2.10. No. of Ventilators per 10,000 population | Rajya Sabha unstarred question no. 2518, dated: 5th August 2021 |
| | | 2.11. No. of blood banks per 10,000 population | Lok Sabha starred question no. 173, dated: 30th July 2021. |
| 3. | Technology Infrastructure | 3.1. No. of mobile connections per 100 people | SDG Index 2020, NITI Aayog, Government of India |
| | | 3.2. No. of Internet Subscribers per 100 people | SDG Index 2020, NITI Aayog, Government of India |
| | | 3.3. Data Reporting Scores | Various State Government Portals/Dashboards |
| 4. | Institutional Support | 4.1. Revenue Expenditure (2. Medical and Public Health) per 10,000 population | State Finances: Study of Budgets (2020), Reserve Bank of India |
| | | 4.2. Revenue Expenditure (3. Family Welfare) per 10,000 population | State Finances: Study of Budgets (2020), Reserve Bank of India |
| | | 4.3. Percentage change in revenue expenditure on health in 2020-21(RE) over 2019-20 (RE) | State Finances: Study of Budgets (2020), Reserve Bank of India |
| | | 4.4. Percentage change in revenue expenditure on health in 2021-22(BE) over 2019-20 (RE) | State Finances: Study of Budgets (2020), Reserve Bank of India |

| | | | |
|---|---|---|---|
| 5. | COVID-19-related Health Outcomes | 5.1. Vaccine Doses per 100,000 population | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | | 5.2. Tests per 100,000 population | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | | 5.3. Deaths per 100,000 population | COVID19 BHARAT Dashboard, dated: 15th December 2021 |
| | | 5.4. Cases per 100,000 population | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | | 5.5. Peak daily caseload per 100,000 population (7-day average) | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | | 5.6. Time taken between the highest peak of daily cases to its 20% (7-day average) | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | | 5.7. Time taken between peak positivity rate to fall below 5% (7-day average) | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | | 5.8. Distributional gap between highest and lowest vaccine coverage per 1000 population (district-wise) | CoWIN Dashboard, dated: 31st October 2021 |
| | | 5.9. Days taken to reach benchmark vaccination coverage of 18+ population | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | | 5.10. Weeks taken to reach benchmark vaccination coverage of 60+ population | CoWIN Dashboard, dated: 30th November 2021 |
| | | 5.11. Gender gap in vaccination coverage (female-to-male ratio) per 18+ 100,000 population | CoWIN Dashboard, dated: 30th November 2021 |

All the indicators use government data as their primary sources. Even the *COVID19 Bharat Dashboard* collates data from governmental sources. All the indicators were normalised and scale biases were removed. The weights were assigned at two stages: at the level of the individual parameters, Principal Component Analysis (PCA) was conducted with 33 component indicators; in the second stage, weights were dictated by informed arbitrariness. The combination helped in simultaneously capturing the variations in capacities and performances of health systems across the various sub-national entities (See Annexure II for further details on data sources and the methodology).

## 3.3. Key Findings

The detailed findings on the relative performances of the states and UTs are available in section 3 of this volume. Other details on the methodology and results on indicators are provided in Annexures 2 and 3. Some of the key findings are as follows:

**1** In terms of the composite scores of HSRI, Goa ranks at the top of all small states, Himachal Pradesh above all large states, and Lakshadweep among the UTs.

**2** There is a significant difference between the average level of resilience in health systems among the states and the UTs, with the UTs performing better (and the difference is found to be statistically significant at 1% level).

**3** States and UTs with higher per-capita income levels are significantly more resilient to combat a potential new wave of the pandemic or any other health crisis of similar magnitude, than the poorer regions.

**4** Meghalaya has done exceedingly well in the domain of institutional support to the health sector. Himachal Pradesh and Sikkim also did relatively well among the remaining states, followed by other small states like Tripura, Goa, and Mizoram. Jammu & Kashmir leads among the UTs.

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Himachal Pradesh, among the large states, and small states like Goa and Tripura have done better than other states in the management of COVID-19-related Health Outcomes. Among UTs, Lakshadweep and Andaman and Nicobar Islands show noteworthy results, even outperforming all states.

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Tamil Nadu and Chhattisgarh (among the larger states) and Goa (among the small states) have the best records in their General Health Profile; among the UTs, Dadra & Nagar Haveli and Daman & Diu are the leaders. A notable aspect is that a high score on General Health Profile has not ensured a high score on COVID-19-related health outcomes for the larger states; rather the pattern is quite the opposite. In Medical Infrastructure, smaller states such as Arunachal Pradesh, Sikkim, and Mizoram have the best population-level services as do larger states like Kerala and Maharashtra. Among UTs, Lakshadweep is most equipped.

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Goa, among the small states and Tamil Nadu and Kerala, among the large states fulfill the most number of criteria for Technology Infrastructure. Delhi leads among the UTs.

Table ES2 shows the HSRI scores and rankings.

## TABLE ES 2: HEALTH SYSTEMS RESILIENCE INDEX SCORES AND RANKING

| | | |
|---|---|---|
| **Large States** | | |
| Himachal Pradesh | 0.58 | 1 |
| Uttarakhand | 0.52 | 2 |
| Karnataka | 0.51 | 3 |
| Tamil Nadu | 0.50 | 4 |
| Rajasthan | 0.49 | 5 |
| Andhra Pradesh | 0.49 | 6 |
| Haryana | 0.48 | 7 |
| Gujarat | 0.48 | 8 |
| Chhattisgarh | 0.46 | 9 |
| Odisha | 0.44 | 10 |
| Telangana | 0.44 | 11 |
| Madhya Pradesh | 0.42 | 12 |
| West Bengal | 0.41 | 13 |
| Assam | 0.41 | 14 |
| Punjab | 0.40 | 15 |
| Maharashtra | 0.40 | 16 |
| Kerala | 0.37 | 17 |
| Bihar | 0.36 | 18 |
| Jharkhand | 0.36 | 19 |
| Uttar Pradesh | 0.33 | 20 |
| **Small States** | | |
| Goa | 0.59 | 1 |
| Mizoram | 0.55 | 2 |
| Sikkim | 0.51 | 3 |
| Tripura | 0.50 | 4 |
| Arunachal Pradesh | 0.47 | 5 |
| Meghalaya | 0.42 | 6 |
| Manipur | 0.35 | 7 |
| Nagaland | 0.34 | 8 |
| **Union Territories** | | |
| Lakshadweep | 0.70 | 1 |
| Andaman & Nicobar Islands | 0.61 | 2 |
| Chandigarh | 0.56 | 3 |
| Ladakh | 0.54 | 4 |
| Delhi | 0.50 | 5 |
| Puducherry | 0.47 | 6 |
| Jammu & Kashmir | 0.47 | 7 |
| Dadra & Nagar Haveli and Daman & Diu | 0.47 | 8 |

Source: Authors' own

## 4. Summing-up

More than two years since the first cases of COVID-19 infections were reported in India, the country is now in the midst of recurring infections. Armed with scientific knowledge—not only of the virus that causes COVID-19 but of life-saving vaccines as well—India must, more crucially now than ever, fill the yawning gaps in the country's health systems. This task will be possible through better data infrastructures to drive policy, and an aggressive push towards Universal Health Coverage. Given that India opted for a phased vaccination process beginning with the most vulnerable groups of the population, the figures of 73.5 percent with a single dose and 69 percent fully vaccinated at the time of finalising this report are indeed remarkable. The following months will see the step-by-step deployment of booster doses for India's remaining population.

The imperative is a collective and targeted effort to scale the immunisation initiative while adhering to COVID-19-appropriate behaviour as a population. India must learn from the past three waves and ramp up investments in health and develop sound strategies for expected future waves. Scientific endeavours and behavioural changes are also essential to minimising the impacts of another sudden increase in infections, and even deaths. The past two years of battling the pandemic forced our health systems to a redesign. Today, as new emergencies emerge in a matter of days, key will be the readiness of systems to respond and mobilise resources efficiently.

This report aims to help light the way for India. Utilising a Resilience Index for States and UTs, this study offers insights into the state of the country's health systems at a disaggregated sub-national level, and the parameters that need to be addressed in the short term. This assessment should pave the path for more researchers and scholars to conduct further research in the domain of comparative spatial assessments, and probe the resilience of health systems to shocks. A similar exercise can be undertaken at the global, local, and micro-levels, to determine the effectiveness of existing healthcare ecosystems in responding to various crises.

*This report should prove useful for decision-makers as it creates a framework for understanding what works and what does not, and therefore can guide necessary course-correction along the way. The public, too, would benefit from this report as they seek to engage with India's democratic architecture.*

# 1

# Introduction

In January 2020, as the world heard the first reports of the novel coronavirus, the medical community had little data with which to formulate responses that could alter the rapid trajectory of what was then an epidemic. Shortly thereafter, in March, the World Health Organization (WHO) declared the outbreak of SARS-CoV-2 a pandemic, and countries immediately implemented lockdowns and restrictions on movement. In India, the first two months of the pandemic saw over 80,000 cases and 2,700 deaths despite a country-wide lockdown from late March.[1] It was at the time that ORF released its report, *State of the States: Two Months of the Pandemic,* which analysed, with the help of emerging data and anecdotal evidence, the initial impact of COVID-19 on India. The key priority then was to delay the spread of infection until health systems could be reinforced and resources ramped up to handle the outbreak.

It helped that the number of medical seats in the country had been increased in recent years—this eased the human resource constraints during the pandemic, as India roped in trainee doctors and medical students to work on the frontlines. Indeed, the last decade saw public investments being channeled to the country's tertiary healthcare sector—in particular, in the supply of health workforce: between 2014 and 2019, there was a 47-percent increase in the number of government medical colleges, and a 33-percent rise in private medical colleges. The number of undergraduate medical seats also saw a jump of 48 percent, from 54,348 in the academic year 2014-15 to 80,312 in 2019-20. While India was expanding the number of seats in government medical colleges, it was also leveraging the private sector to fill gaps in personnel and healthcare delivery.[2]

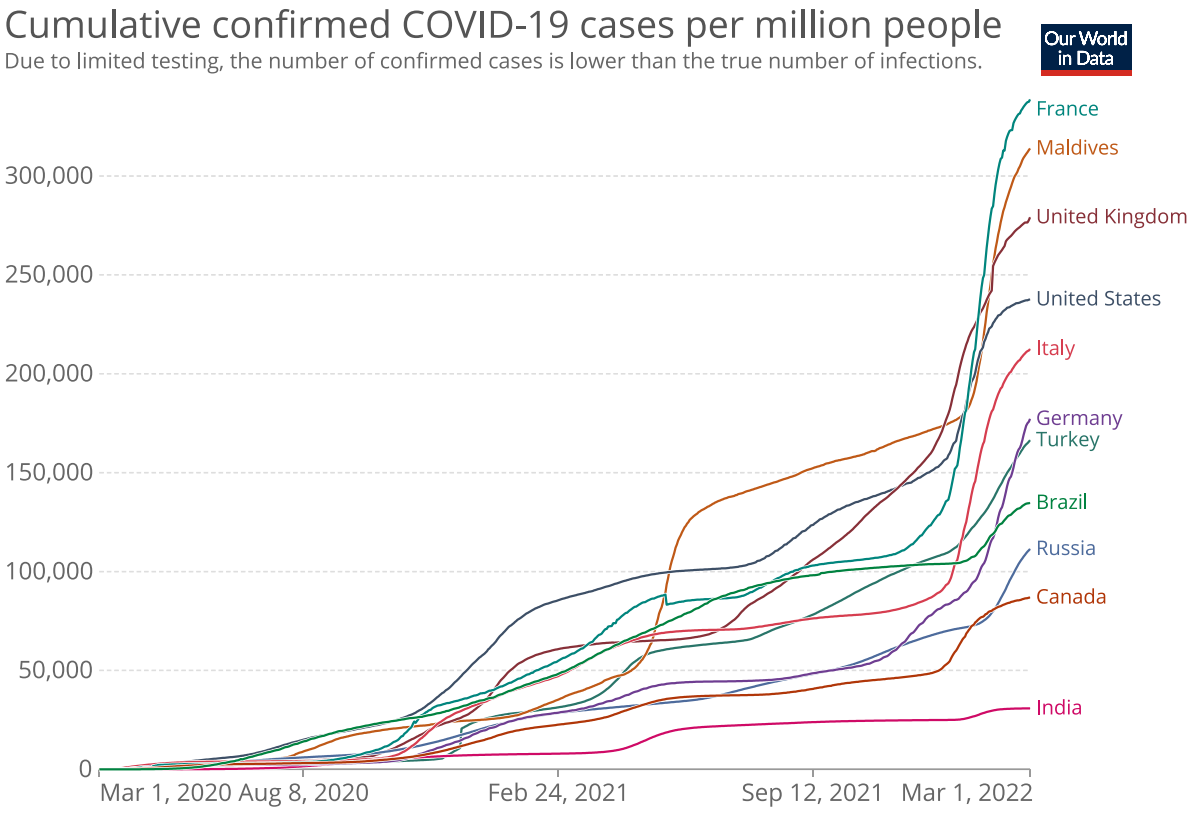
Over the past decades, India's health outcome indicators have shown consistent improvement, much of it being achieved despite inadequacies in both policy attention and financing. When the National Health Policy 2017 set a target of allotting 2.5 percent of GDP to government expenditure in health by 2025, most analysts were of the view that the goal was highly ambitious. The next three or so years will reveal whether India reaches that target, and if the COVID-19 pandemic will prove to be a motivation. The Union budget of 2021 announced a new centrally sponsored scheme, the PM Atma Nirbhar Swasthya Bharat Yojana with an outlay of INR 64,180 crores over six years, aimed at developing the capacities of primary, secondary, and tertiary care systems and strengthening capacities from detection to cure.[3] However, despite such schemes and the financing of the massive COVID-19 vaccination and screening efforts, the health sector outlays have remained low even during the pandemic years. Even the 2022 Union budget—which provides that the outlay for capital expenditure be enhanced by 35.4 percent from INR 5.54 lakh crore last year to INR 7.50 lakh crore, left the health sector largely untouched.[4]

Government agencies at the forefront of the COVID-19 battle have had to do with the limited resources at their disposal. In April 2020, the Ministry of Health and Family Welfare instituted a three-tier COVID-19 Treatment system to facilitate triaging and thereby maximise constrained supplies.[5] The first line of testing and detection was assigned to Fever Clinics or local health centres. Suspect or positive patients then moved through the bottom-up, three-tiered structure, from COVID-19 Care Centres to Dedicated COVID-19 Hospitals. Care Centres ensured bigger spaces for isolating both symptomatic and asymptomatic, very mild cases. Tier-2, Dedicated COVID-19 Health Centres are for mild to moderate cases, and the most severe, symptomatic cases were referred to Dedicated COVID-19 Hospitals.

While most states have followed the three-tier structure, some like Kerala have added further levels of management based on criteria such as space for isolation and need for medical monitoring. Meanwhile, a number of states have not set up Fever Clinics at all. Delhi, for instance, decided to employ its own network of Mohalla clinics for preliminary diagnosis and surveillance.

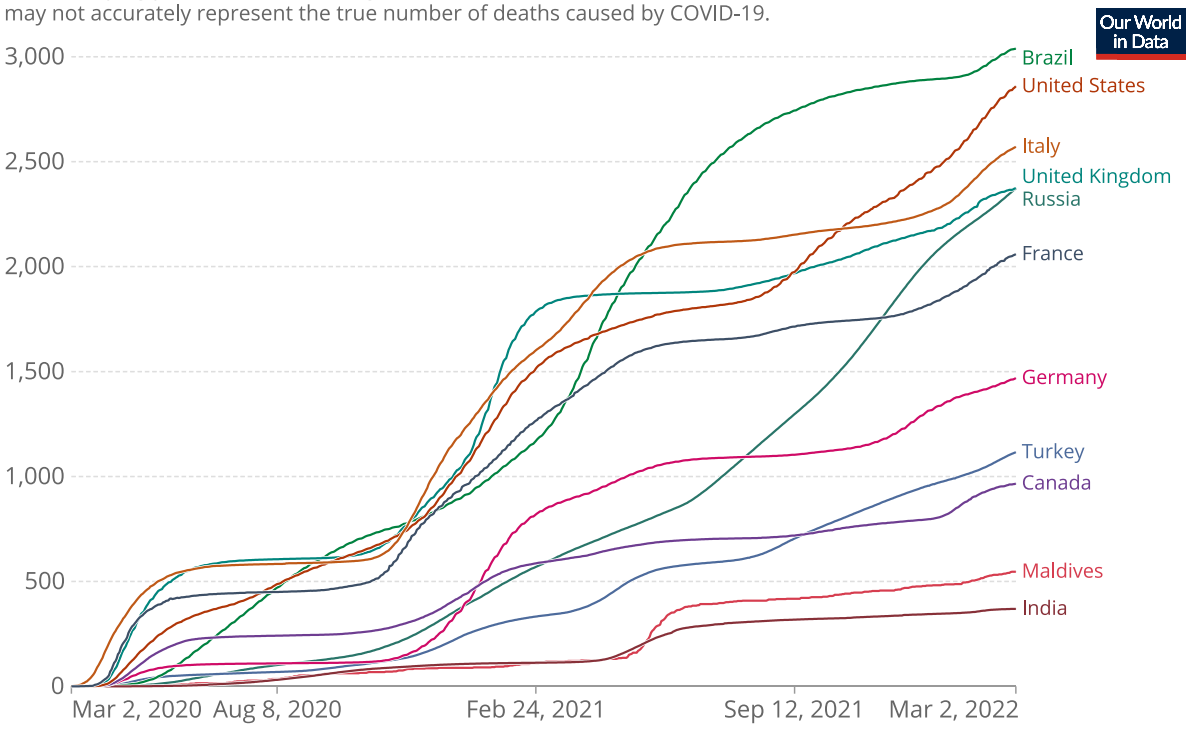
At the time of writing this report, almost 500 million COVID-19 cases have been confirmed globally. India has recorded nearly 42 million of these cases, amounting to about 31,000 cases per million people. The country officially recorded close to 370 deaths per million population. It ranks much lower in both cases and deaths when compared to advanced economies, with notably smaller countries facing a bigger burden on its population-level impact.

## FIGURE 1: CUMULATIVE CONFIRMED COVID-19 CASES PER MILLION ACROSS THE WORLD




Source: Our World in Data[6] (collated from various official sources)

## FIGURE 2: CUMULATIVE CONFIRMED COVID-19 DEATHS PER MILLION ACROSS THE WORLD




Source: Our World in Data[7] (collated from various official sources)

ORF's own research has catalogued India's dogged efforts to manage the COVID-19 crisis.[8] India's performance becomes even more remarkable with the massive vaccination drive that covered the largest numbers of population in the shortest period of time. Indeed, on some parameters, India has performed better than certain developed nations that claim to have far superior infrastructure and higher healthcare spending (see Figures 1 and 2, and the vaccination numbers).

India has vaccinated 73.5 percent of its population with a single dose, and 69 percent are fully vaccinated. These figures become more notable when compared to a country like the US, for example, whose size is one-fourth that of India's but has fully vaccinated a lower 66 percent of its population. The ensuing months will witness how India fares in the step-by-step deployment of booster doses for the remaining population.

At the same time, however, the apparent success story at the macro-level is not reflective of the nation's chequered pandemic journey: a pathway fraught with tremendous challenges at various points.

India began with a degree of success in mid-2020 because of the swift lockdowns and focused promotion of appropriate COVID-19 behaviour such as regular handwashing, the wearing of masks, and physical distancing. Eventually, restrictions were eased, and the first wave peaked in September 2020. The sharp rise in cases was attributed to poor adherence to masking and appropriate behaviour during the festive season. Cases and deaths would thereafter fall sharply, until a massive second wave in April and May 2021 ended the notion that India had been able to contain the pandemic and the crisis had met its end. The degree of transmission was so intense that the sero-positivity rate increased from 24.1 percent in January 2021 to 67.6 percent in July 2021.[9] By early May, the death rate had spiked to almost 4,000 people every day.

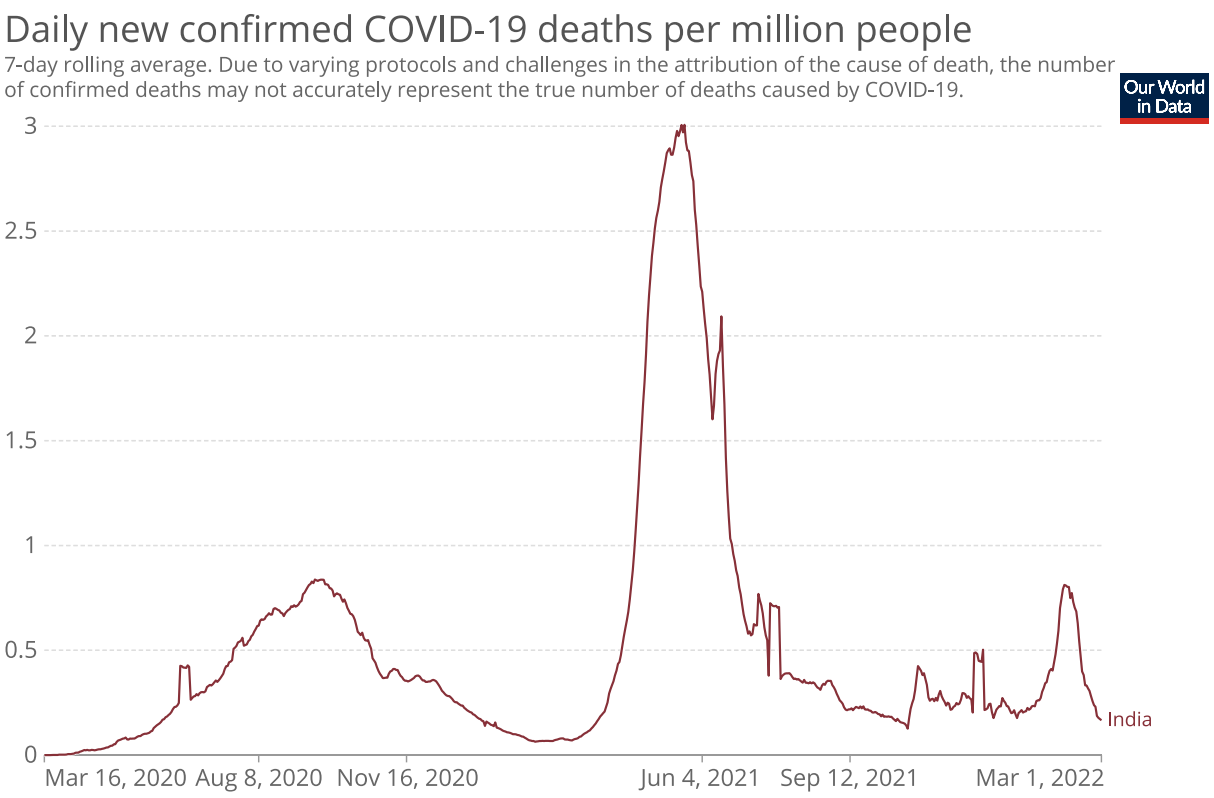
As steep as these numbers are, however, they are possibly still higher on the ground.[10] The under-counting could be the result of a number of reasons: sub-national discrepancies in scientific standards and definitions; delayed penetration of COVID-19-related preventive services into sub-urban and rural areas; and weak data and communication systems. Evidence suggests, for example, that socially vulnerable populations like women and the poor are often left out of surveillance simply because the health-seeking behaviour of these groups are unaccounted for in planning.[11]

After the cruel second wave, there have been efforts to calculate "excess" deaths during the pandemic. *A Lancet study* estimates 4.07 million excess deaths in India compared to the official number of half a million between January 2020 and December 2021.[12] WHO's recent estimates show a similar statistic.[13] Computations by Indian scholars, too, have suggested excess deaths to be nearly eight times the official figure.[14] Further, a model by *The Economist* puts excess deaths in India between 1.9 million and 9.7 million by end-2021.[15] The range of these estimates is wide, owing to uncertainty about the quality of both data sources and assumptions.[16] The Union Government quickly denied the estimates, because all the models are based on a host of hypothetical assumptions of conditionalities, and their functional forms largely deviate from real-life conditions.

Recounting and adding backlogs are not easy tasks, given the varying degrees of institutionalisation of medical care across the country and the changing definitional guidelines for classifying deaths due to COVID-19. According to ORF's *COVID-19 Tracker,* about 86,000 deaths have been added as backlogs[17] between June 2021 and March 2022—or about 16 percent of all reported COVID-19 deaths in India today.[18] However, only 19 states and UTs ever reported backlogs in deaths. Bihar and Kerala added more than 50 percent of all their COVID-19 deaths through backlog counting and compensation appeals.[19] Other states like Karnataka, Madhya Pradesh, Maharashtra, and Tamil Nadu have also been consistently adding numbers to their logs. Media reports also point to much higher numbers of *ex-gratia* claims for compensation of COVID-19 deaths, compared to the reported numbers.[20]

Yet, 2021 was not only about rapid transmission dynamics and mounting deaths; it was also the year that the vaccination rollout was initiated. The drive faced acute shortages shortly after being started in January 2021, but eventually picked up pace and accelerated in the latter part of the year. India is currently using four vaccines, and ten more have received emergency approvals.[21] As of 15 March 2022, more than 80 percent of the population above 45 years of age, and 75 percent of the 18-44 cohort, are fully vaccinated. The coverage for the younger group of 15- to 17-year-olds is at 46 percent. At its current levels of mass inoculation, India has come closer to community-level protection as milder infections continue to help build natural immunity against the virus. Figure 3 shows the patterns of this attuned immunity—even through the Omicron-led third wave, hospitalisation and deaths remained largely consistent and low.

## FIGURE 3: DAILY NEW CONFIRMED COVID-19 DEATHS IN INDIA




Source: Our World in Data[25] (collated data from www.mygov.in)

This report offers a unique *Health Systems Resilience Index* that measures how, and to what extent states and regions across India have adapted to the COVID-19 crisis and grew in capacities over the past year. Each state and UT is profiled in three broad areas: (a) their current health profile—which uses indicators such as demographics (as per the 2021 projections), 2020 ranking in Sustainable Development Goal 3 (Good Health and Well-being), regular vaccination coverage for under-fives, out-of-pocket health expenditure, and causes of mortality; (b) COVID-19 preparedness and response (which offers a population-level description of the states' medical infrastructure, technological response, and government investments); and (c) COVID-19 cases, deaths, tests, and vaccination.

While the initial research for this study was conducted in early 2021, the last leg of the data collection was ended in November-December 2021. The development of the index, and the writing and production of this report was all done in early 2022, as the highly transmissible Omicron wave of COVID-19 was receding in India, even as the country continued to reel from its impacts. Unlike the Delta-led second wave, which was gradual in its

ebbs and flows and yet far more fatal, the third wave was rapid to rise and equally quick to fall, with considerably lower incidence of hospitalisation and less fatalities, too.[23]

The daily reported cases have come under 5,000 at the time of writing this report, and life is slowing getting back to normal as children have gone back to school and even recreational facilities are operating at full capacity. The high level of vaccine coverage and infection-induced natural immunity has kept fatalities low during the third wave led by the Omicron variant and its sub-lineages. Despite the rapid pace of vaccination, subsequent waves of the virus may still recur in the coming months, given the very nature of a pandemic—i.e., prolonged, with repeated waves of infections. It is vital to reassess the situation and re-strategise the country's preparedness.

India has historically suffered from a scarcity of timely and quality data that could inform crucial decisions on healthcare, though the situation has started improving over the last decade. Optimally utilising available data sources, this report offers a data-driven perspective of the performance of India's 28 states and eight UTs during the first two years of the COVID-19 pandemic. It proceeds from the assumption that because Health is a State subject, policies and strategies are planned and executed according to each State's priorities. State capacities and instruments mediate the health sector's financing and governance capabilities, and programme implementation may vary significantly across different states.

In practice, the Union Government has so far played a largely prescriptive role through policy and drug control. But COVID-19 was an exogenous shock that disrupted the fundamentals of the socio-economic architecture of the global economy, as well as those of individual countries, including India's. The sheer scale of the pandemic required the Union Government to invoke the Disaster Management Act 2005 and the Epidemic Diseases Act 2020. That does not take away the responsibilities of the sub-national entities, their initial infrastructure and endowments, and their responses to the outbreak, especially during the disastrous first and second waves.

Meanwhile, there is a view that both the states and the Centre should have legislative powers over healthcare, and in 2019, the High-Level Group on Health constituted under the Fifteenth Finance Commission made precisely this recommendation—i.e., shifting healthcare under "Concurrent Subjects".[24] While the implementation of such a recommendation is pending, any assessment of crisis response is best conducted at the sub-national level. The question remains as to how, in India, "cooperative federalism" can

minimise "conflictual federalism" and bring the pandemic under control.[25] A comparative analysis of the prospects of India's states and UTs confronting the challenges of a likely next COVID-19 wave—or another health crisis of similar magnitude—can guide policymakers towards an efficient roadmap.

## Notes on Structure, Methodology, and Sources

This report is divided into four main sections: Following the Introduction, Section 2 provides an overview of individual states and UTs; Section 3 introduces the Health Systems Resilience Index, and ranks the states and UTs on a comparative scale of quantifiable indicators within specific themes to assess their respective health systems. Section 4 concludes the report.

Section 2 offers the reader a comprehensive view of the performance of each state. The elements in the state profiles include other parameters that were not available yet at the time of publication of ORF's first *State of the States* report. These include the numbers of COVID-19 dedicated three-tier health facilities and beds, testing laboratories, and sample collection centres; the technological innovations and investments; as well as parameters on data reporting and granularity.

Each state and UT profile is divided into three sections: general health; COVID-19 preparedness; and government response. The report provides graphical representations of COVID-19 trends and preventive measure of cases, deaths, tests and vaccinations over a span of 20 months. The COVID-19 statistics were culled from a credible, volunteer-driven data platform, *COVID19india* (later continued by COVID19bharat collective), which collates numbers from information bulletins officially released by the respective state governments or their health ministries.

The General Health Profile of the state or UT includes indicators such as age-wise demographics, population density, regular immunisation coverage, out-of-pocket expenditure in health, insurance coverage, top causes of mortality, death rates – both general and related to COVID-19, and per capita revenue expenditure of the state for medical and public health and family welfare. To provide already established scales of evaluation for states' performances, the report also uses the Bare Necessities Index (Economic Survey 2020, Ministry of Finance) and the SDG 3 India Index for Good Health and Well-being (2020). The scales cover a wide range of social determinants of health.

Immunisation programmes and health spending are discussed as well, using data from the National Family Health Survey 5 (2019-20). Per capita out-of-pocket health expenditure data has been sourced from NITI Aayog's SDG Index 2020.

It is well-established that comorbidities are significant catalysts of mortality and morbidity in COVID-19 infections. While there is a range of medical conditions to study in this spectrum, the researchers have chosen Diabetes and Kidney Diseases, Neoplasms (Cancers), Respiratory Infections and TB, and Cardiovascular Diseases—this is because these diseases cover a gamut of known leading non-communicable diseases for which proper treatment is crucial. The data on the prevalence of such NCDs and the death rates have been taken from a pre-COVID-19 period (2019)—to reflect the pre-existing risk factors in the respective states. The data is sourced from the *Global Burden of Disease: India Compare Study (2019)* by Institute for Health Metrics and Evaluation (IHME) and Public Health Foundation of India (PHFI). Moreover, these comorbidities are more predominant among certain age groups who are thereby more vulnerable to a contagion. Therefore, an age-wise composition of the state's population has been computed in accordance with the government's vaccine policies of under-18 years, 18-44 years, 45-60 years, and 60+ years age groups. The distribution has been computed by the research team using estimates from the Census 2021 projection of population, a detailed process of which is discussed in a latter section of this report.

The section on Preparedness and Response focuses on Medical and Technological efforts to leverage better COVID-19 management. It covers human resources, the physical infrastructure of hospitals, health centres, care centres, laboratories, and vaccination sites, as well as the technological groundwork and initiatives unique to each state and UT. The SDG Index provides the number of doctors, midwives, and nurses, while the National Health Profile (2020) provides the number of registered pharmacists within the state or UT.

The technological response was chosen for this section because the pandemic necessitated a push towards adopting new technologies. The idea was to explore whether the innovative solutions being brought to these areas truly benefit these populations. There has been a historical mismatch between the digital skills across gender, class, caste, and rural-urban divide in the country. At the same time, data is scanty on how these new technologies have been adapted and if the target populations are able to access them.

The crisis also pushed governments to creatively leverage existing technologies like IVRS, Geo-tagging, Geo-fencing, and GPS, while advancing towards more cutting-edge innovations in Machine Learning and Artificial Intelligence to ease the burden on their human resources. These new technologies, in the past two years, were adapted and implemented aggressively for better surveillance and monitoring, contact-tracing, information dissemination, diagnostics, and remote assistance. Since these are essential platforms for multi-sectoral interactions with the health system for better management, this section puts into perspective the overall numbers of mobile-phone and internet users in the state or UT. This can help assess current connectivity capacities and the reach of state-led technology initiatives in the grassroots.

All these parameters need government support to take effect. Therefore, 'Institutional Support' focuses on budgetary allocations and dedicated COVID-19 management and related financing from the 2021-22 Budgets. It gives a picture of the state's pandemic governance priorities and post-pandemic plans. For individual state profiles, the budget highlights have been collated from Budget documents and mainstream media reports.

The third section of this report introduces the Health Systems Resilience Index. The resilience index is a composite measure comprising five sub-indices based on the elements discussed in Section 1. The context for the development of the index, along with its structure and methodology, is discussed in detail later in the report; more information is provided in the Annexure.

Much of the data is from the period between the second and third waves from August and November 2021. By then, the health facilities were less overwhelmed, and temporary setups were reduced, compared to April-May 2021 at the peak of the second wave. The state-wise graphical representations of COVID-19 statistics—Cases, Deaths, Tests, and Vaccinations—range from May 2020 to December 2021.

ORF exerted its best efforts to source information only from verified government sources. All data variables considered for this study have Government of India sources as their fundamental origin and are available in the public domain. Not a single data has been sourced from a non-governmental origin. On the basis of such data, the report presents a new composite index—one that encapsulates a comprehensive evaluation of the level of resilience of each state and UT that considers the COVID-19 pandemic as a "stress test" for health systems. A detailed list of references and their limitations is given in Annexure I. The report closes with a comparative analysis involving the states and the UTs, based on their average levels of preparedness and across different levels of per-capita incomes.

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25 Cooperative federalism refers to a harmonious and coordinated relationship between the centre and the state governments, in order to work on a variety of public policy programmes.

Conflictual federalism is characterised by a situation of centre-state and/or state-state clashes because of political, social, economic and other reasons, impeding the implementation of various welfare programmes and policies.

# 2

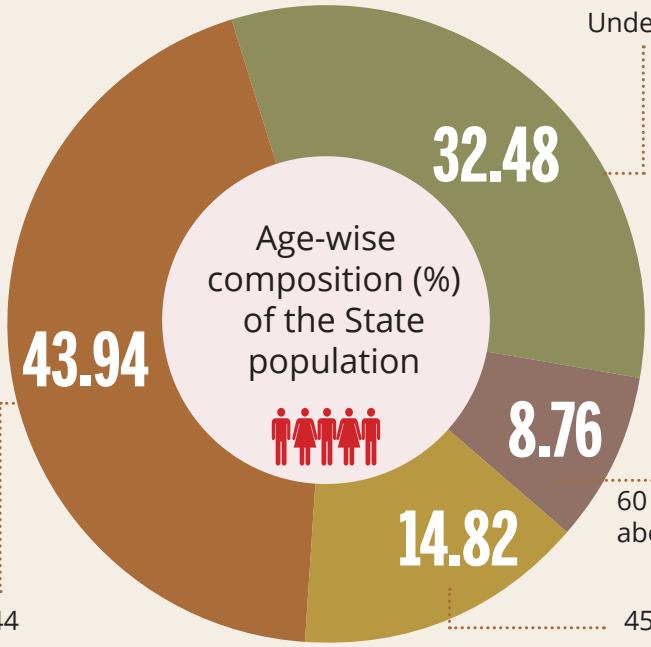
# Profiles of India's States and Union Territories

# CENTRAL INDIA

Chhattisgarh, Madhya Pradesh, Uttarakhand,
Uttar Pradesh

# CHHATTISGARH

Total population
**29,492,000**




Population density
**218.15 per km²**

## HEALTH PROFILE

RANK AMONG
28
**26**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**71.4%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**79.7%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**6.6%**

**Above 0.7**

Below 0.5 | 0.5 - 0.7 | Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Stroke
- Ischemic Heart Disease
- Diarrheal diseases
- Chronic obstructive pulmonary disease
- Neonatal disorders

Total deaths per 100,000 (2019)
**773.05**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**46.10**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.004
2. Dedicated COVID-19 Health Centres: .....0.013
3. Dedicated COVID-19 Care Centres: .....0.06
4. Dedicated COVID-19 Beds: .....6.498
5. COVID-19 Sample collection Centres: .....0.119
6. COVID-19 Testing Laboratories: .....0.419
7. No. of Ventilators: .....0.137
8. No. of Blood Banks: .....0.032
9. No. of Physicians, nurses, midwives: .....14.73
10. No. of registered pharmacists: .....5.89
11. Vaccination sites: .....0.934

## TECHNOLOGICAL RESPONSE

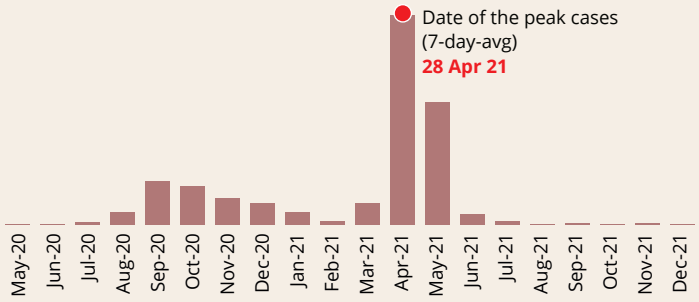
1. Number of Mobile connections per 100 population (mobile tele density): 67.99
2. Number of Internet subscribers per 100 population: 44.24
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

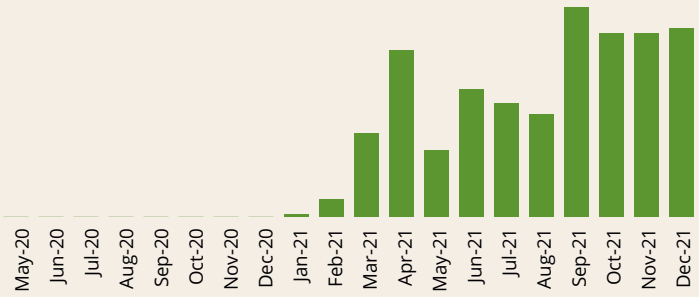
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | No |

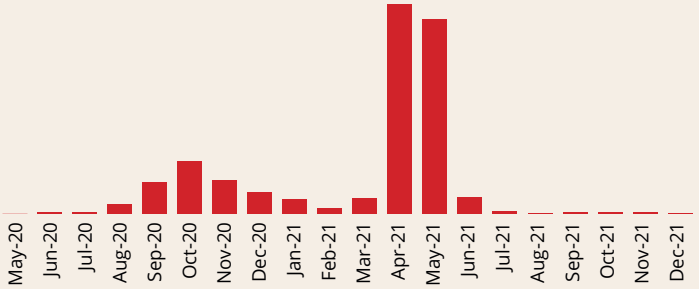
MONTHLY CASES



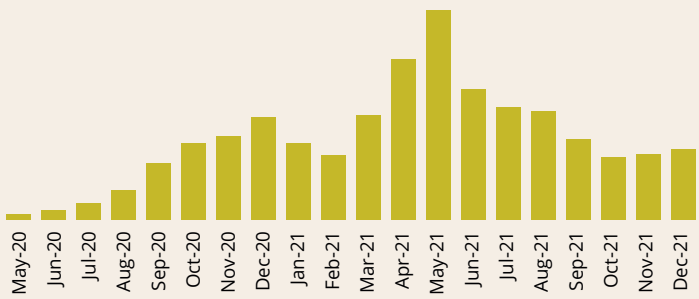

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

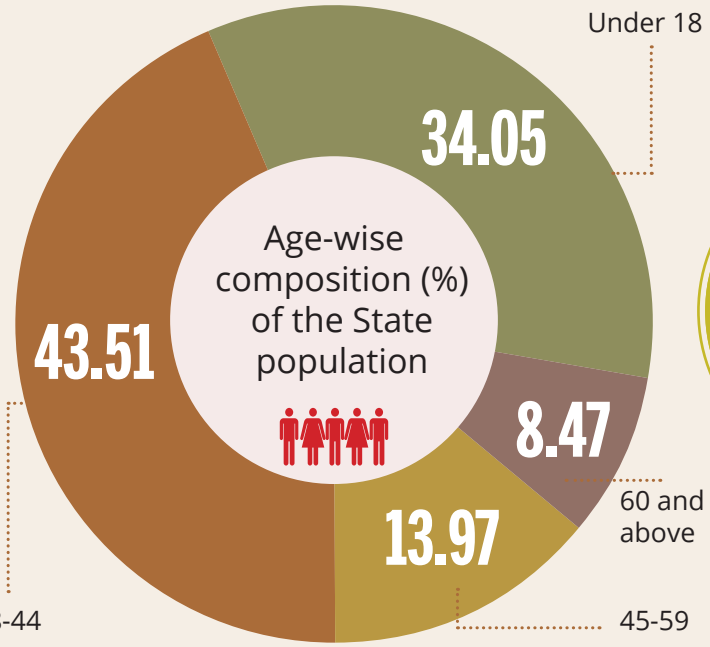
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Assistance of INR 0.5 M for families of media persons dying due to the novel coronavirus to be provided (announced in May 2021).
- Provision of INR 10 M for upgrade of Community Health Centres at Ramanujganj and Rakhi (Nava Raipur) into 100 bed-hospital and 50-bed hospitals respectively
- Provision of INR 175 M to construct 25 Sub-health centres, 10 Primary Health centres and 2 Community Health centres.
- Provision of INR 10 M for the establishment of Virology Lab in 9 Government Medical Colleges.
- Dedicated INR 10 B to provide free vaccines for every adult in the target age group of 18-45 years.

# MADHYA PRADESH

Total population
**84,516,000**




Population density
**274.18 per km²**

## HEALTH PROFILE

RANK AMONG
28
**23**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**38.1%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**77.1%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**12.2%**

**Above 0.7**

Below 0.5 | 0.5 - 0.7 | Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Diarrheal diseases
- Stroke
- Lower Respiratory Infection

Total deaths per 100,000 (2019)
**674.87**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**12.45**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.004
2. Dedicated COVID-19 Health Centres: .....0.017
3. Dedicated COVID-19 Care Centres: .....0.091
4. Dedicated COVID-19 Beds: .....3.93
5. COVID-19 Sample collection centres: .....0.09
6. COVID-19 Testing Laboratories: .....0.04
7. No. of Ventilators: .....0.2
8. No. of Blood Banks: .....0.02
9. No. of Physicians, nurses, midwives: .....32.84
10. No. of registered pharmacists: .....6.94
11. Vaccination sites: .....0.8

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 113.58
2. Number of Internet subscribers per 100 population: 38.73
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

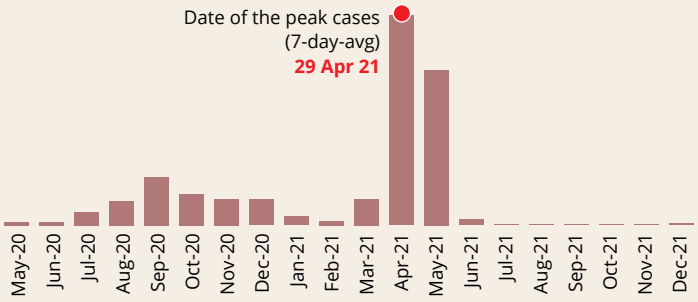
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | NA |
| If Bulletin available in English | No |

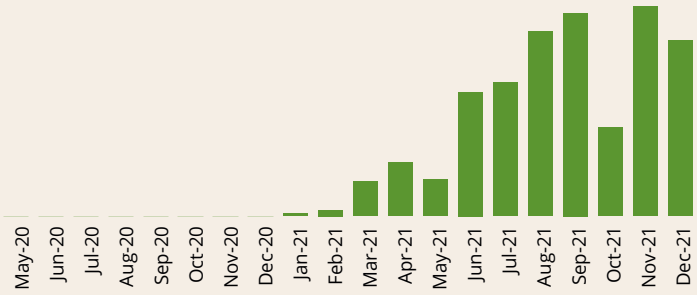
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Indore 311 Application:** The application, which existed earlier, was repurposed by the MP government to assist in managing asymptomatic covid patients. It enables patients in home isolation to monitor their oxygen level and pulse rate by a pulse oximeter. The patients are monitored by a team of doctors at the IMA (Indore Medical Association) control room, and their movement around their houses is also tracked.[2]
2. **Vizbee:** A startup, used drones to conduct sanitization in large areas as well as for surveillance.[3]
3. **Healthquick:** A mobile application developed to map the location of COVID-19 suspects in Bhopal, to be able to view hotspots as well as to understand the contact history of patients.[4]
4. **The Kabadiwala**[5] **:** A waste management startup, repurposed its operation to use GPS-based technology to deliver food supplies with over 200 vehicles.

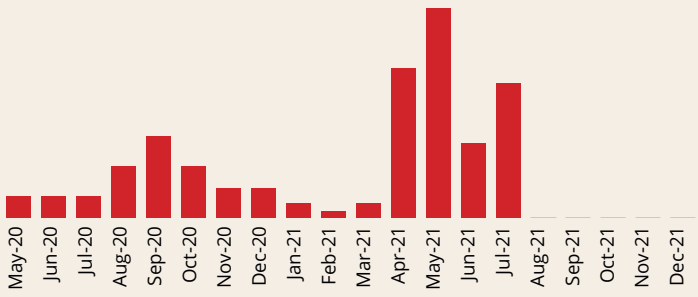
### MONTHLY CASES



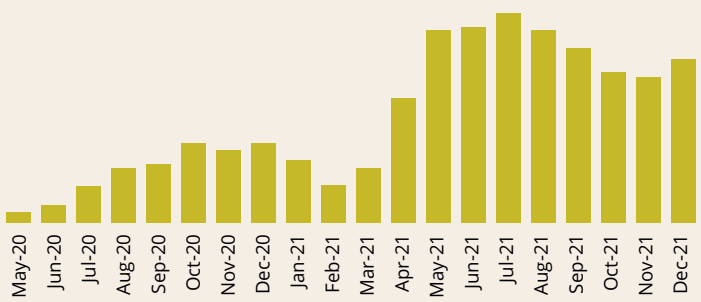

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

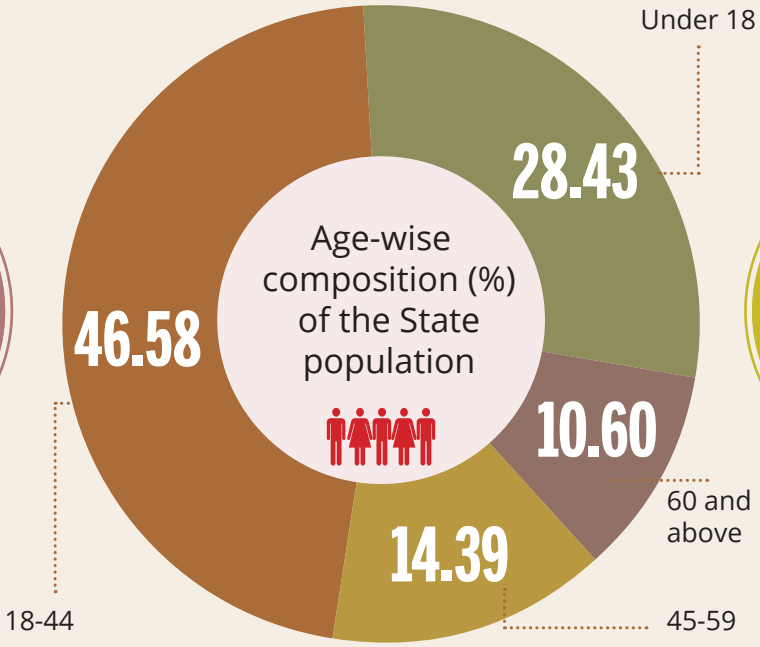
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- The state has made a provision of INR 30,350 M for National Rural Health Mission
- The Government drafted a policy incentivising the setting up of Oxygen plants by proposing a basic investment assistance of 50 percent in plant machinery, building and more, or a maximum assistance of INR 750 M.[7]
- **CM COVID-19 Bal Kalyan Yojana:** To disburse INR 5,000 per month for 'Covid orphans' — referring to those who have lost both their parents during the second wave of the virus.[8]

# UTTRAKHAND

Total population
**11,396,000**




Population density
**213.08 per km²**

## HEALTH PROFILE

RANK AMONG
28
9

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**62.5%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**80.8%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**12.5%**

Above 0.7

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Tuberculosis
- Lower respiratory infection
- Stroke

Total deaths per 100,000 (2019)
**771.17**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**65.05**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.004
2. Dedicated COVID-19 Health Centres: .....0.011
3. Dedicated COVID-19 Care Centres: .....0.366
4. Dedicated COVID-19 Beds: .....12.170
5. COVID-19 Sample collection Centres: .....0.326
6. COVID-19 Testing Laboratories: .....0.120
7. No. of Ventilators: .....0.65
8. No. of Blood Banks: .....0.041
9. No. of Physicians, nurses, midwives: .....13.55
10. No. of registered pharmacists: .....16.538
11. Vaccination sites: .....0.507

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 113.58
2. Number of Internet subscribers per 100 population: 38.73
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | Yes | No |

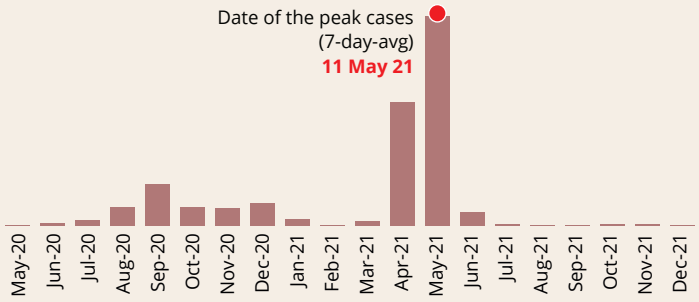
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

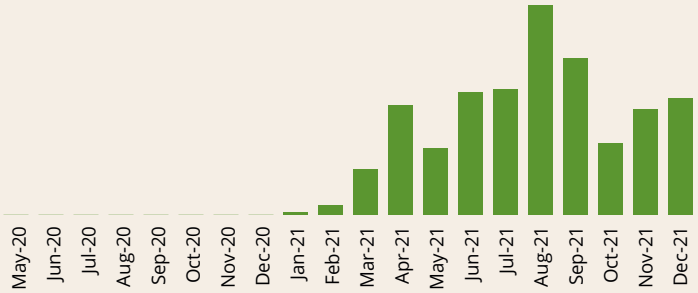
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Monal 2020**[12]: It is a remote health monitoring solution built by Electronics Corporation of India Limited (ECIL), under the Department of Atomic Energy (DAE) and launched by AIIMS, Rishikesh. The setup consists of a wearable instrument for monitoring COVID-19 patient vital parameters and remotely displays these on the doctor's mobile phone, laptop/desktop in charge from any location. It also makes use of Google Maps and BHUVAN software to identify patient's locations.

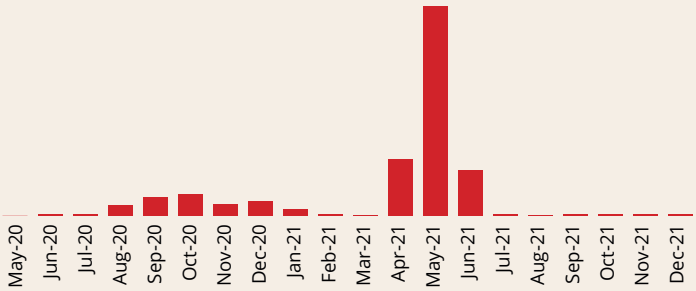
MONTHLY CASES



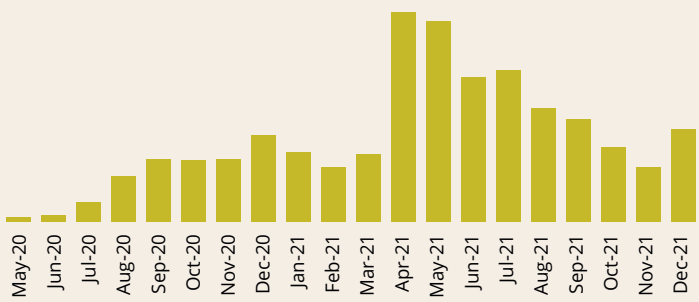

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

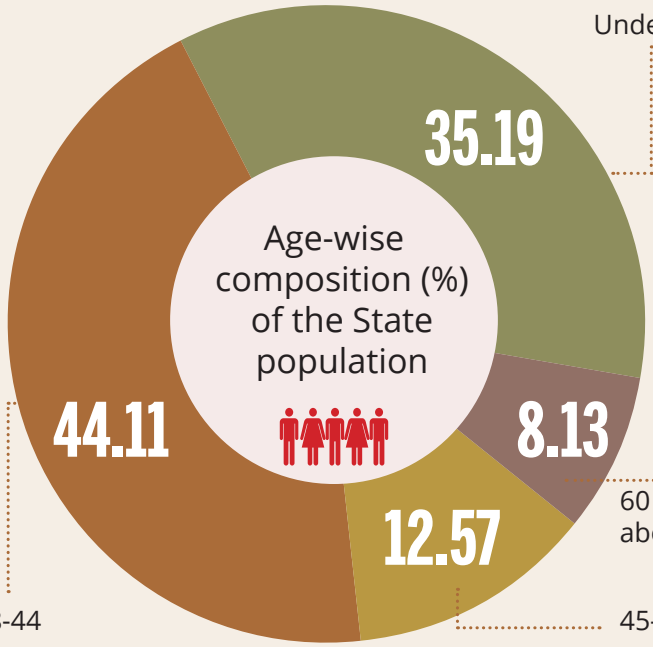
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- In light of the economic losses from the COVID-19 lockdowns, financial assistance of INR 3,400 M has been approved to strengthen roads and other works in the state under the Special Assistance Scheme for capital expenditure.
- The state government will bear the total cost of the vaccination drive, estimated to be around INR 4,000 M.
- In June 2021, the Government of India released INR 8,940 M to strengthen the state's health services and operation of essential public health services for 2021-22.

# UTTAR PRADESH

Total population
**230,906,000**




Population density
**958.40 per km²**

## HEALTH PROFILE

RANK AMONG
28
27
SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**15.9%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**69.6%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**16.6%**

Above 0.7
Below 0.5
0.5 - 0.7
Above 0.7
BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY
- Ischemic Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Chronic Kidney disease
- Diabetes

Total deaths per 100,000 (2019)
**739.68**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**9.92**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.007
2. Dedicated COVID-19 Health Centres: .....0.005
3. Dedicated COVID-19 Care Centres: .....0.021
4. Dedicated COVID-19 Beds:.....2.315
5. COVID-19 Sample collection centres: .....0.01
6. COVID-19 Testing Laboratories: .....0.03
7. No. of Ventilators: .....0.188
8. No. of Blood Banks: .....0.016
9. No. of Physicians, nurses, midwives: .....13.55
10. No. of registered pharmacists: .....3.837
11. Vaccination sites: .....0.058

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 67.62
2. Number of Internet subscribers per 100 population: 38.73
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

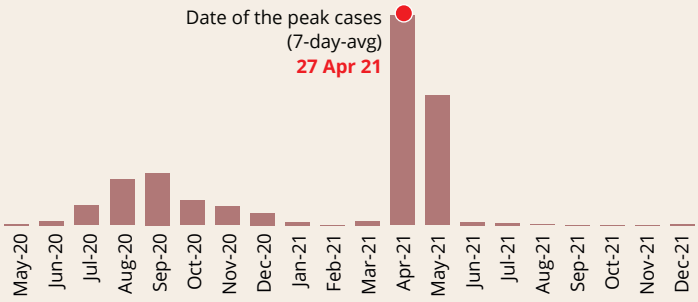
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | No |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | No |

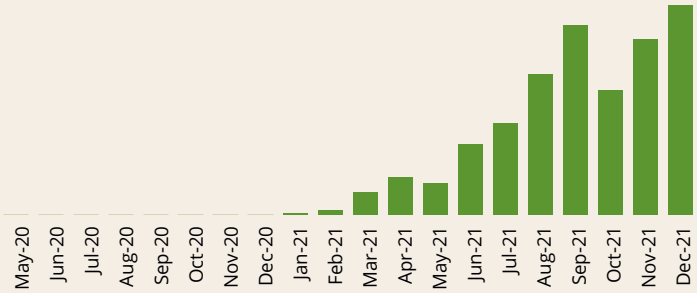
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Jansunwai[9] :** Online portal launched where migrants returning from other states can register themselves. Migrants stranded in other states can register themselves on the portal.
2. **Pooled Sampling:** UP was the first state to employ pooled sampling by using the same in low prevalence settings. Such samples were subjected to Nucleic Acid Amplification Technique (NAAT) to detect COVID-19. As per this method, individual testing is initiated if the pool indicates a negative result.[10]

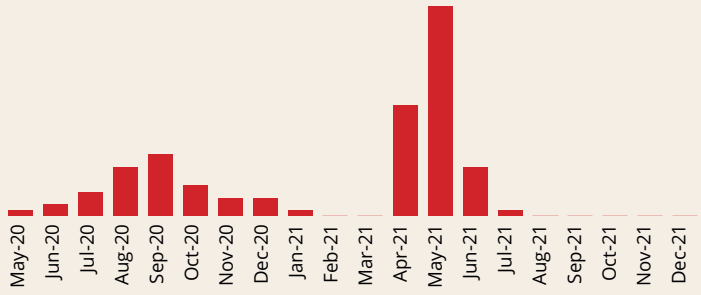
### MONTHLY CASES



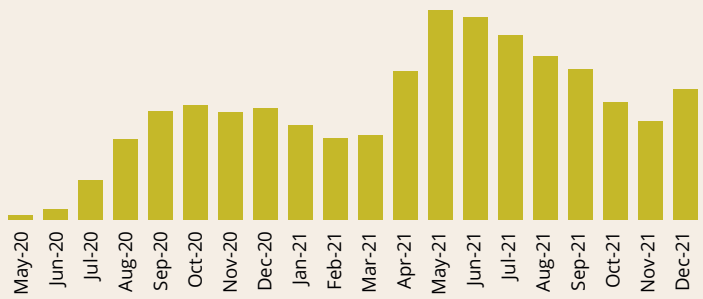

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

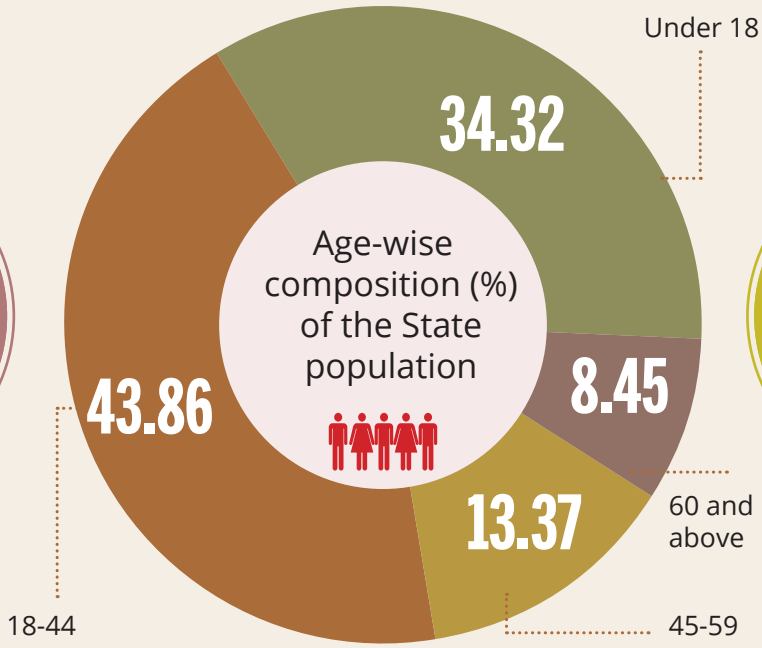
- The state will provide free COVID-19 vaccines for all adults and has allocated INR 500 M to procure these vaccines.
- The state has allocated INR 53,950 M under the National Rural Health Mission.
- INR 50,850 M has been provided to construct medical colleges in 39 districts and create diagnostic infrastructure for primary healthcare facilities.

# EAST INDIA

Jharkhand, West Bengal, Odisha, Bihar

# JHARKHAND

Total population
**38,472,000**




Population density
**482.65 per km²**

## HEALTH PROFILE

RANK AMONG
28
**11**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**50.3%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**73.9%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**11.0%**

**Below 0.5**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Diarrheal Diseases
- Ischemic Heart Disease
- Chronic Obstructive Pulmonary Disease
- Neonatal Disorders
- Stroke

Total deaths per 100,000 (2019)
**523.68**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**13.37**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: ..... 0.005
2. Dedicated COVID-19 Health Centres: .....0.016
3. Dedicated COVID-19 Care Centres: .....0.051
4. Dedicated COVID-19 Beds:..... 1.13
5. COVID-19 Sample collection centres: .....0.18
6. COVID-19 Testing Laboratories: .....0.46
7. No. of Ventilators: .....0.231
8. No. of Blood Banks: .....0.016
9. No. of Physicians, nurses, midwives: .....3.94
10. No. of registered pharmacists: .....0.04
11. Vaccination sites : .....0.263

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 57.55
2. Number of Internet subscribers per 100 population: 30.99
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

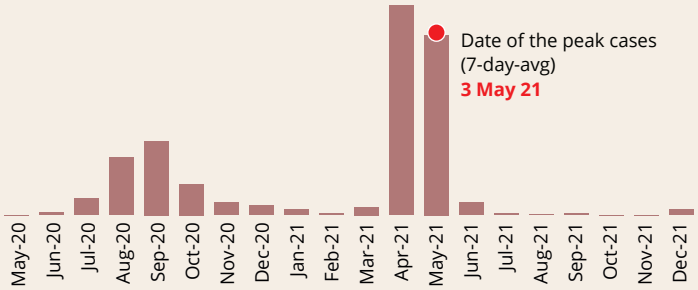
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | No |
| Social Media | No |
| If Bulletin available in English | Yes |

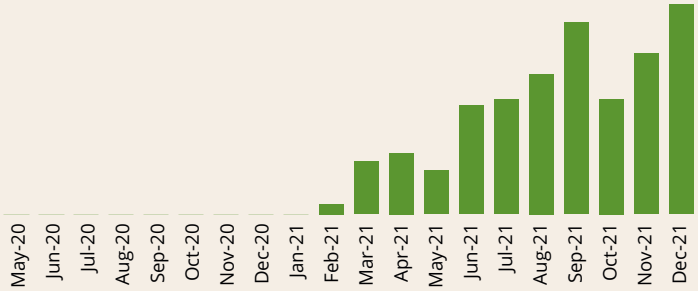
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Jharkhand Bazar App:** This is a mobile application initiative taken by the state government to link customers with the shopping stores (grocery stores and pharmacies) in their vicinity using location services. The residents must apply for and receive their M-passes (merchant passes) through this application to shop in selective stores within two hours.
2. Corporates such as Ziqitza[i] and Tata Steel[ii] have offered emergency services through ambulances, testing kits and setting up of Covid facilities.

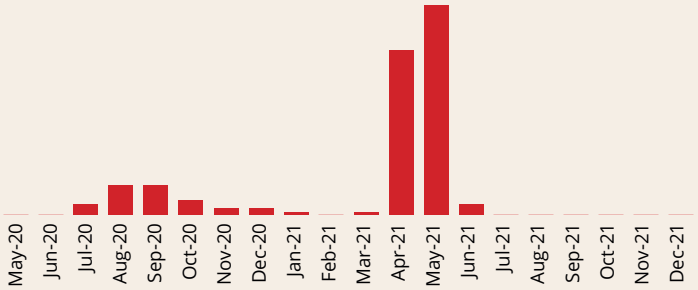
MONTHLY CASES




MONTHLY VACCINATIONS




MONTHLY DEATHS

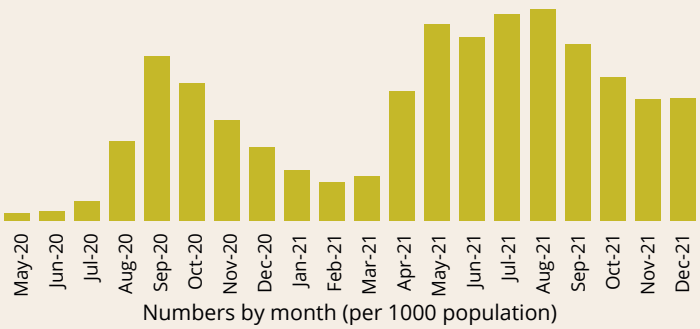



## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

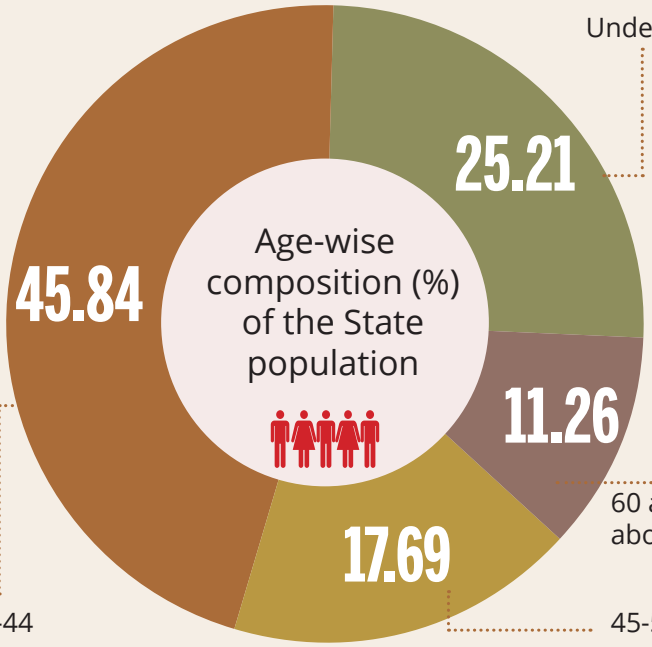
- INR 13,550 M has been allocated for the National Health Mission.

MONTHLY TESTS



# WEST BENGAL

Total population
**98,124,000**




Population density
**1,106 per km²**

## HEALTH PROFILE

RANK AMONG
28
**10**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**29.3%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**87.8%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**16.9%**

**Below 0.5**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Stroke
- Chronic Obstructive Pulmonary Disease
- Diarrheal diseases
- Lower Respiratory Infections

Total deaths per 100,000 (2019)
**593.18**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**20.01**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.08
2. Dedicated COVID-19 Health Centres: .....0.014
3. Dedicated COVID-19 Care Centres: .....0.103
4. Dedicated COVID-19 Beds: .....3.61
5. COVID-19 Sample collection centres: .....0.11
6. COVID-19 Testing Laboratories: .....0.03
7. No. of Ventilators: .....0.14
8. No. of Blood Banks: .....0.015
9. No. of Physicians, nurses, midwives: .....26.72
10. No. of registered pharmacists: .....9.134
11. Vaccination sites (as of 1st October, 2021): .....0.46

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 80.99
2. Number of Internet subscribers per 100 population: 51.74
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | Yes |
| Age-wise Segregation | No | Yes |

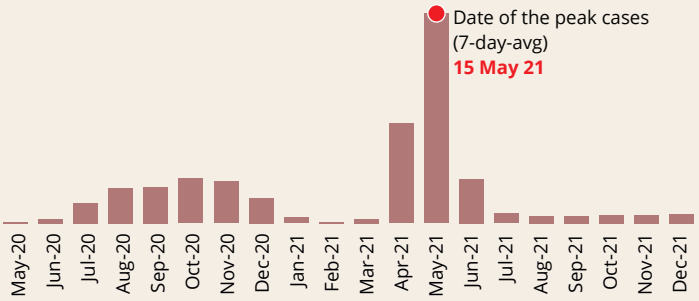
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

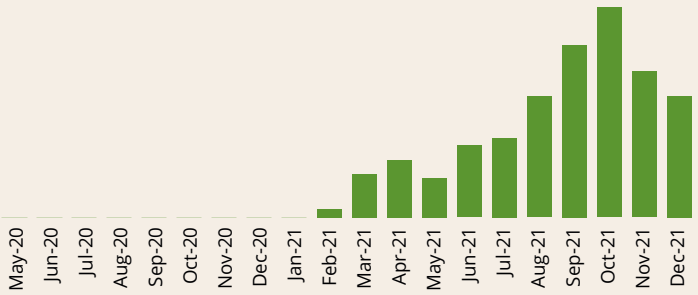
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

- **West Bengal Integrated CoVID Management System (WBICMS):** This is an online portal that focuses on monitoring, coordination, and management of various corona activities and functions by providing real time information related to the availability of beds, ambulances, admission to different COVID facilities and track oxygen production and distribution to health centers within the state.

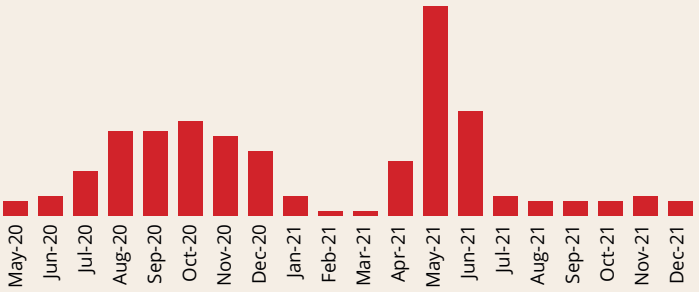
### MONTHLY CASES



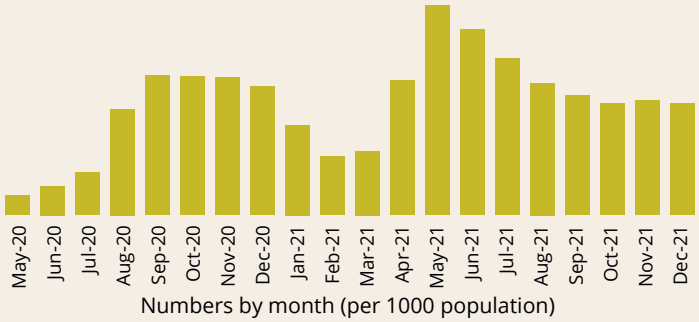

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS



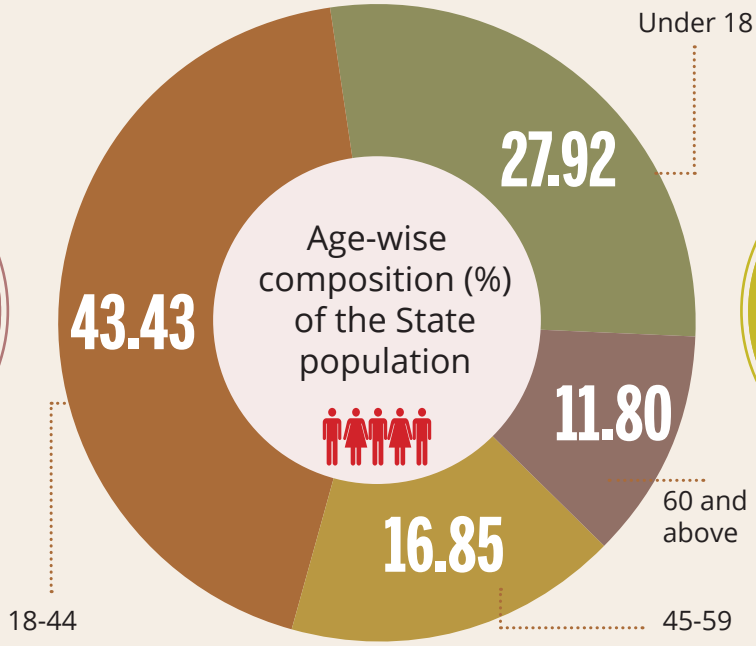

## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- In July, 2021, INR 38,000 M was allocated by the state government for the Covid fight and Swasthya Sathi Scheme.

# ODISHA

Total population
**44,035,000**




Population density
**282.81 per km²**

## HEALTH PROFILE

RANK AMONG
28
**18**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**47.9%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**90.5%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**13.1%**

Below 0.5

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

Below 0.5
0.5 - 0.7
Above 0.7

TOP 5 CAUSES OF MORTALITY

- Diarrheal Diseases
- Stroke
- Ischemic Heart Disease
- Tuberculosis
- Lower Respiratory Infections

Total deaths per 100,000 (2019)
**734.34**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**19.28**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.008
2. Dedicated COVID-19 Health Centres: .....0.005
3. Dedicated COVID-19 Care Centres: .....0.043
4. Dedicated COVID-19 Beds: .....5.34
5. COVID-19 Sample collection centres: .....0.15
6. COVID-19 Testing Laboratories: .....0.05
7. No. of Ventilators: .....0.127
8. No. of Blood Banks: .....0.02
9. No. of Physicians, nurses, midwives: .....39.44
10. No. of registered pharmacists: .....7.34
11. Vaccination sites : .....0.327

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 75.09
2. Number of Internet subscribers per 100 population: 44.87
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | No |
| Age-wise Segregation | Yes | No |

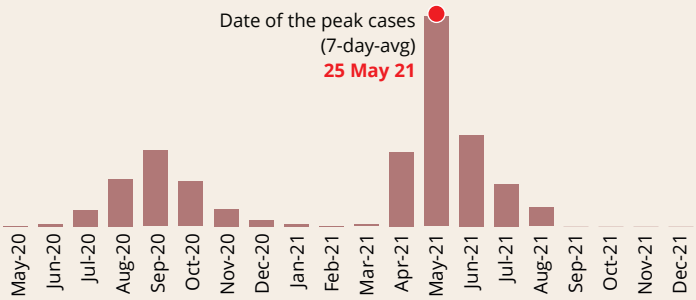
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

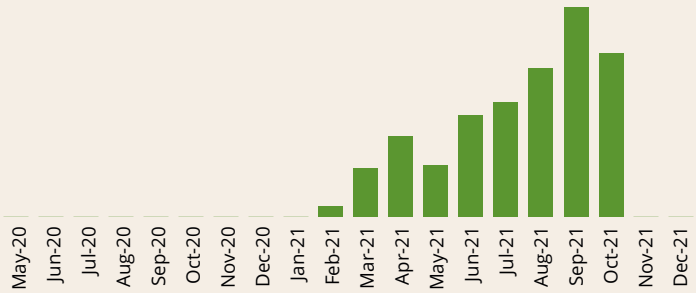
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Coronavirus Response Management Platform (CRMP):** The state government in collaboration with Deloitte, deployed an Artificial Intelligence (AI) based questionnaire to evaluate the condition of Nizamuddin returnees to Odisha while they were quarantined in their homes. The AI questionnaire was used extensively to identify and geo-locate high-risk groups to provide them with customized treatment and routine follow-ups. This module is a cloud-based population analytics platform utilizing 1500 social determinants of health to identify populations with a higher chance of facing impediments to self-quarantine to direct them to nearby services.
2. **Operational Telemedicine Service:** Using Interactive Voice Response (IVR) tool, the Odisha government provided a free-of-charge telemedicine helpline service for patient consultation and to disseminate information to access various COVID-19 resources. Deployment of this service employed 300 medical professionals who alleviated public apprehension related to coronavirus.

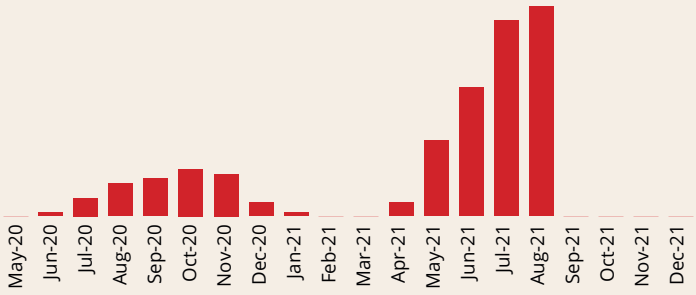
MONTHLY CASES



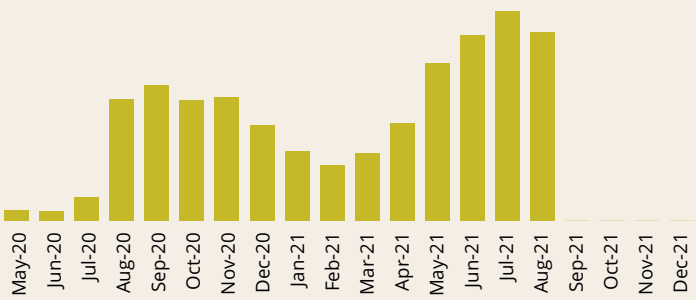

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

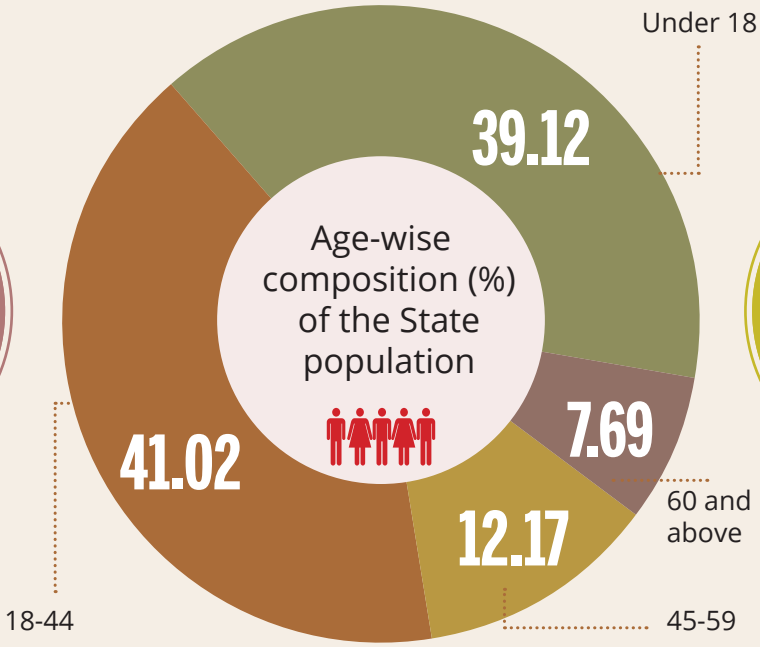
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 22,2670 M has been allocated to Odisha to manage the COVID pandemic, INR 91,640 M for Public Health Care, and INR 30,500 M is contributed for Disaster Management by the state and Centre government.
- INR 630 M has been allocated to manage COVID-19 and emergency healthcare facilities under Public Health Response Fund, while INR 1,7550 M has been provided for National Health Mission.

# BIHAR

Total population
**123,083,000**




Population density
**1307.13 per km²**

## HEALTH PROFILE

RANK AMONG
28
**21**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**14.6%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**71%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**14.5%**

**0.5 - 0.7**

Below 0.5 | 0.5 - 0.7 | Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Diarrheal Diseases
- Chronic Obstructive Pulmonary Disease
- Neonatal Disorders
- Stroke

Total deaths per 100,000 (2019)
**550.72**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**9.82**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.000
2. Dedicated COVID-19 Health Centres: .....0.008
3. Dedicated COVID-19 Care Centres: .....0.021
4. Dedicated COVID-19 Beds: .....2.077
5. COVID-19 Sample collection centres: .....0.008
6. COVID-19 Testing Laboratories: .....0.02
7. No. of Ventilators: .....0.041
8. No. of Blood Banks: .....0.007
9. No. of Physicians, nurses, midwives: .....16.79
10. No. of registered pharmacists: .....1.95
11. Vaccination sites: .....0.85

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 50.65
2. Number of Internet subscribers per 100 population: 30.99
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

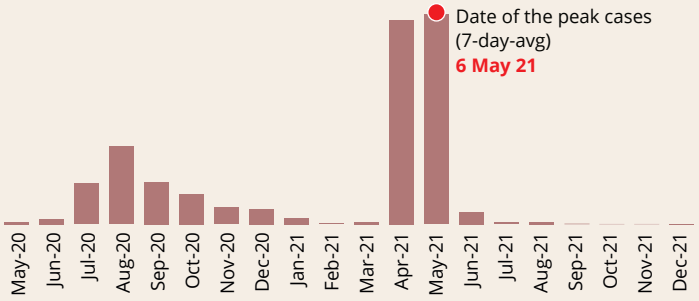
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | No |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | No |

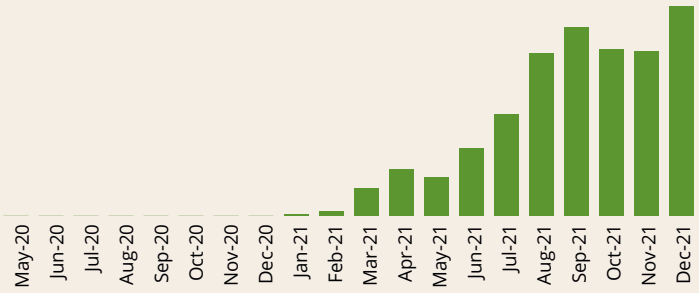
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Norway India Partnership Initiative (NIPI) for AI Development[vi] :** NIPI, after approval from the Bihar government, is working with the Wadhwani Institute of Artificial Intelligence to diagnose COVID-19 through cough sound analysis. This tool will serve as the first level of the COVID-19 screening test done through a smartphone-based application. It will also be implemented in Madhya Pradesh, Rajasthan, Odisha and Jammu and Kashmir.
2. **Bihar Corona Sahaayta Mobile App:** The Disaster Management Department Government of Bihar announced a scheme that allows candidates to download the Bihar Corona Urgent Help Mobile App to get the help of INR 1000 after filling an application form on the app.

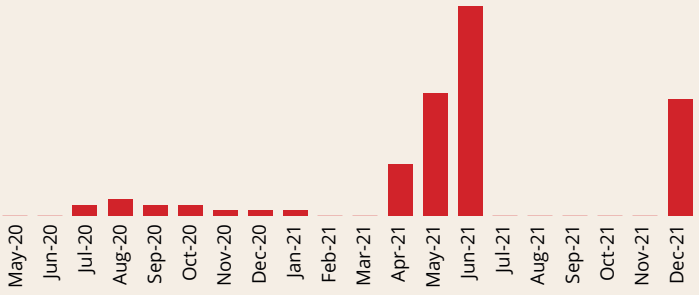
MONTHLY CASES



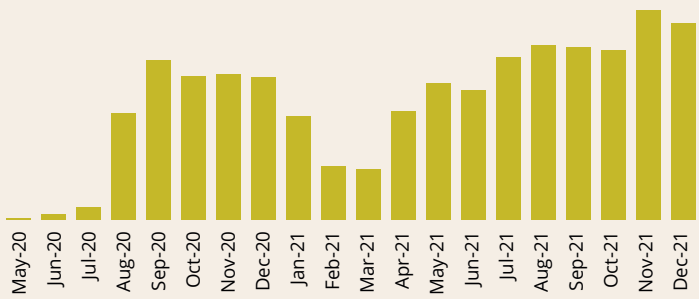

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS



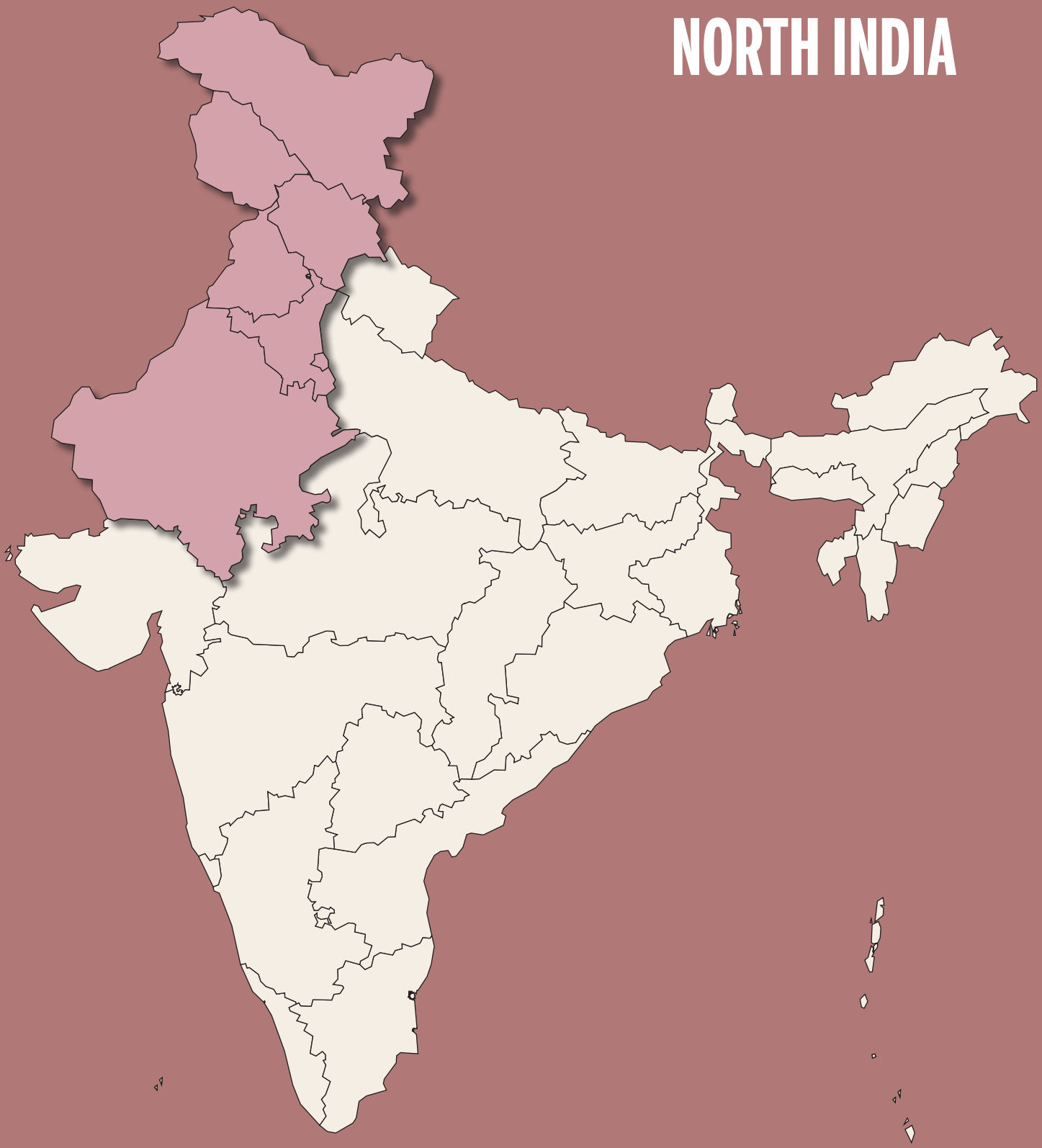

Numbers by month (per 1000 population)

## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- In 2020, a budget of INR 6,600 M was allocated from the Disaster Response Fund of the state's budget for COVID-19 management in the form of rapid antigen testing, personal protective equipment kits, ventilators, medicine, daily food for the covid patients, and more.
- In May 2021, the Bihar government announced to pay a sum of INR 0.4 M to the next relative of a patient who died of COVID-19.
- The new budget is dedicated to upgrading the existing healthcare infrastructure, including hospital beds and more, to meet future requirements. The amount is distributed as follows - INR 55,400 M for Patna Medical College and Hospital, INR 745.6 M for Indira Gandhi Heart Hospital, INR 2,150 M for Loknayak Jai Prakash Narayan Hospital and INR 1,729.5 M for nine district hospitals.

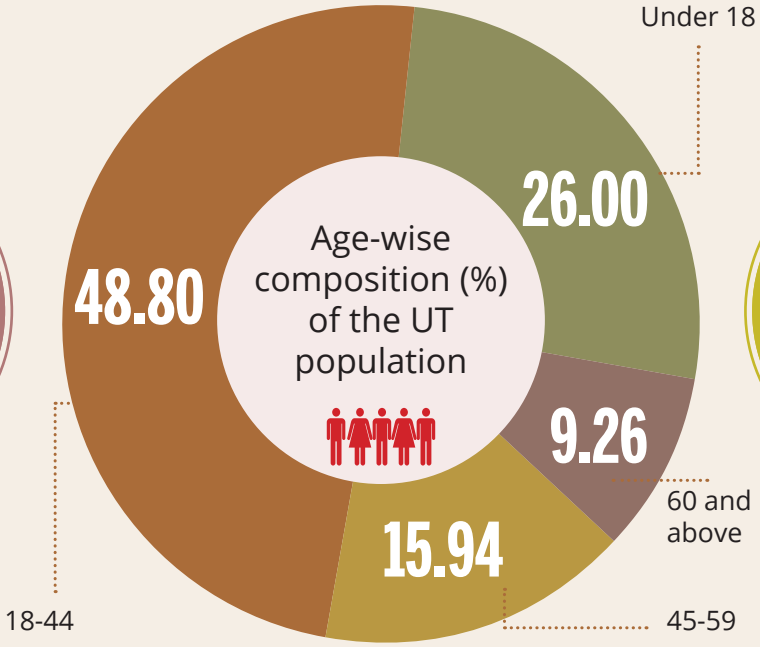
# NORTH INDIA



Delhi, Chandigarh, Haryana, Ladakh, Punjab,
Jammu and Kashmir, Himachal Pradesh, Rajasthan

# DELHI

Total population
**20,572,000**




Population density
**13862.53 per km²**

## HEALTH PROFILE

RANK AMONG
8
1

SDG 3
(GOOD HEALTH & WELL BEING)
INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**25%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**76%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.2%**

Above 0.7

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Cirrhosis
- Neonatal Disorders

Total deaths per 100,000 (2019)
**486.59**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**122.01**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.063
2. Dedicated COVID-19 Health Centres: .....0.002
3. Dedicated COVID-19 Care Centres:.....0.014
4. Dedicated COVID-19 Beds: .....17.23
5. COVID-19 Sample collection centres: .....0.209
6. COVID-19 Testing Laboratories: .....0.121
7. No. of Ventilators:.....0.367
8. No. of Blood Banks: .....0.036
9. No. of Physicians, nurses, midwives: .....50.41
10. No. of registered pharmacists: .....15.02
11. Vaccination sites: .....0.659

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 190.61
2. Number of Internet subscribers per 100 population: 199.88
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

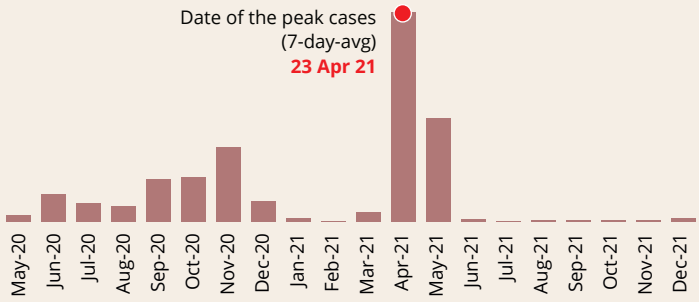
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

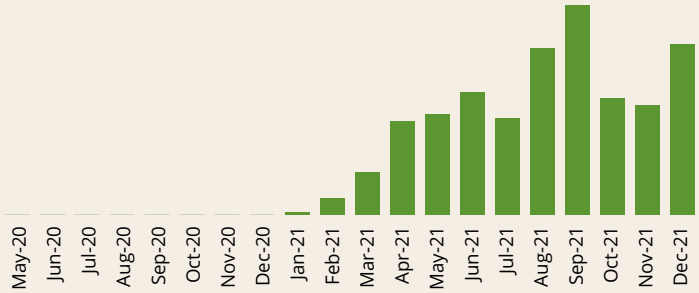
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Delhi Corona App:** Launched by the Govt. of Delhi for disseminating real-time covid information on cases, availability of different kinds of beds across dedicated hospitals, testing labs, etc.[1]
2. **Milagrow iMap 9 and Humanoid ELF:** Created by Milagrow HumanTech, both these technologies focus on eliminating physical inter-person interactions. The iMap 9 is a robot designed for floor disinfection with an ability to navigate and sanitize while Humanoid ELF monitors and interacts with COVID-19 positive patients.

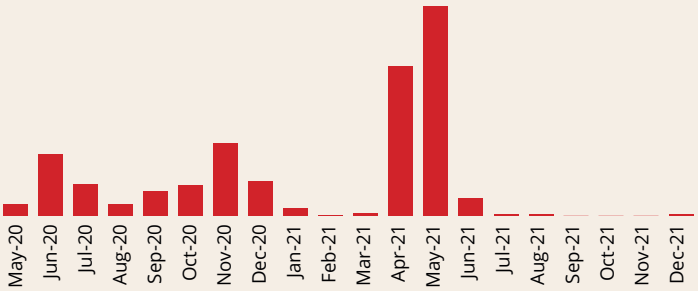
### MONTHLY CASES



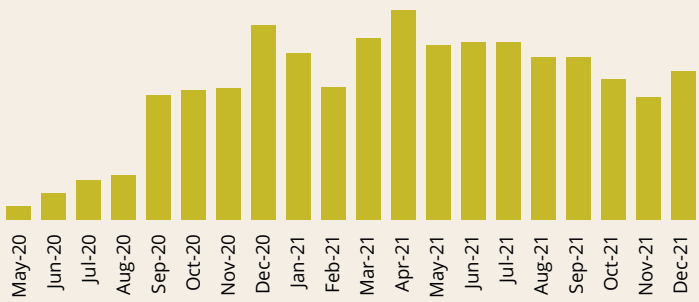

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

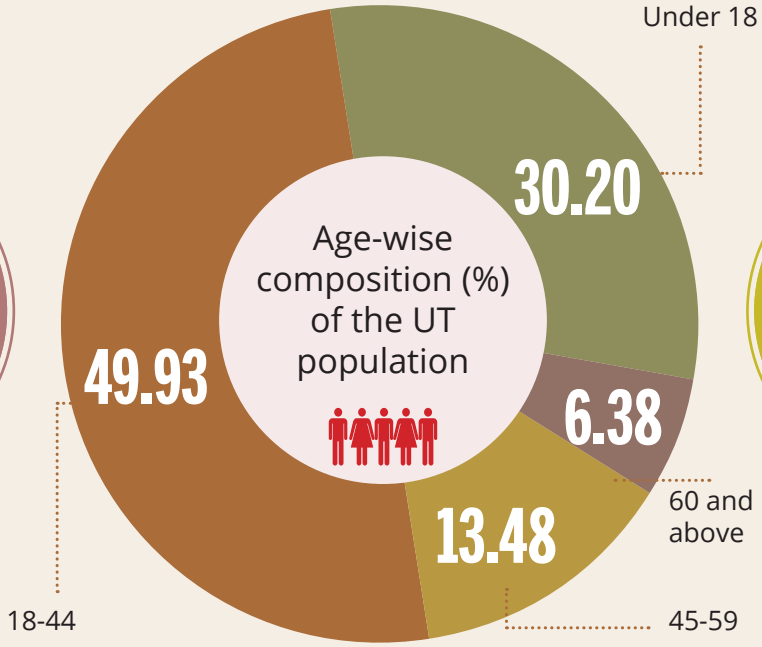
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 30 M was spent last year on creating Quarantine facilities for Indians coming from abroad, and the provision was extended to INR 500 M for 2021-22.
- INR 12,930 M allocated to health-related infrastructure expansion with the construction of new hospitals in Jwalapuri, Sirspur, Madipur and Vikaspur and redesigning 19 existing ones; resulting in an increase of bed capacity by 14,000
- INR 500 M is dedicated to the new *'Aam Aadmi Free Covid Vaccine'* scheme, which will provide free COVID-19 vaccines at all government hospitals.

# CHANDIGARH

Total population
**1,208,000**




Population density
**10,596.5 per km²**

## HEALTH PROFILE

RANK AMONG
8
**4**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**32.2%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**80.9%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.5%**

**Above 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Falls
- Chronic Kidney Disorders

Total deaths per 100,000 (2019)
**533.43**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**89.07**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.017
2. Dedicated COVID-19 Health Centres: .....0.050
3. Dedicated COVID-19 Care Centres:.....0.108
4. Dedicated COVID-19 Beds: .....7.682
5. COVID-19 Sample collection centres: .....0.141
6. COVID-19 Testing Laboratories: .....0.157
7. No. of Ventilators: .....0.621
8. No. of Blood Banks: .....0.033
9. No. of Physicians, nurses, midwives: .....1.43
10. No. of registered pharmacists: .....38.34
11. Vaccination sites: .....0.563

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 136.42
2. Number of Internet subscribers per 100 population: NA
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | Yes |
| Age-wise Segregation | No | No |

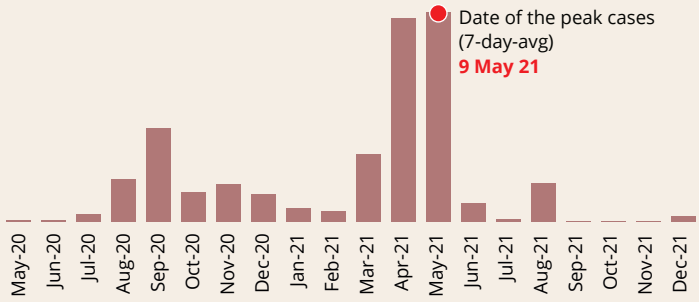
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | No |
| If Bulletin available in English | Yes |

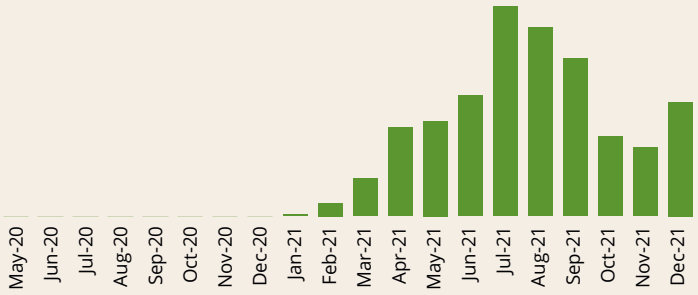
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **CVD Tracker App:** Application launched by Chandigarh administration to track people quarantined at home using geofencing technology to create a virtual perimeter for a real-world geographical area. The operations of the app are overseen by the Department of Information Technology, the Quarantine team of Municipal Corporation, Police Department, in association with Webcom Systems Pvt. Ltd.[4]
2. **Remote surveillance of severe patients:** A cloud-based system was integrated with the ICU screens of hospitals by the Post Graduate Institute of Medical Education and Research at Mohali. This was created to avoid contact between healthcare workers and covid patients and to monitor patients' vitals easily. Clarity Medical, a company based in Mohali, sold 14 such systems to hospitals.[5]

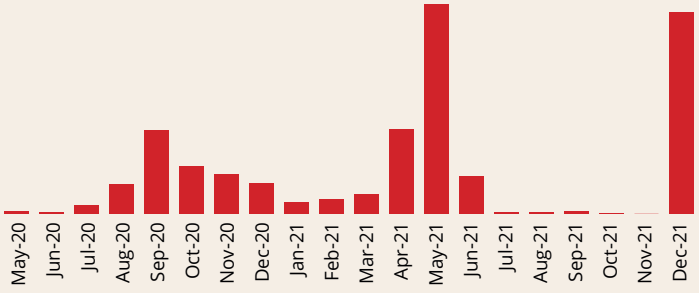
### MONTHLY CASES



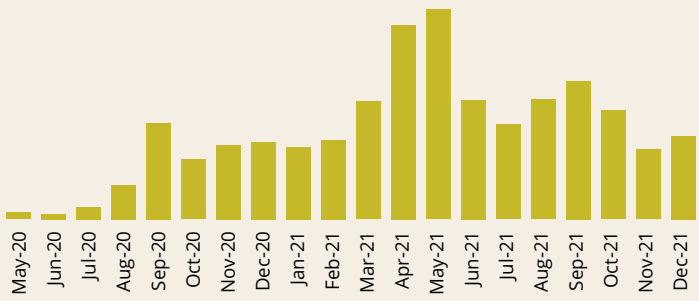

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

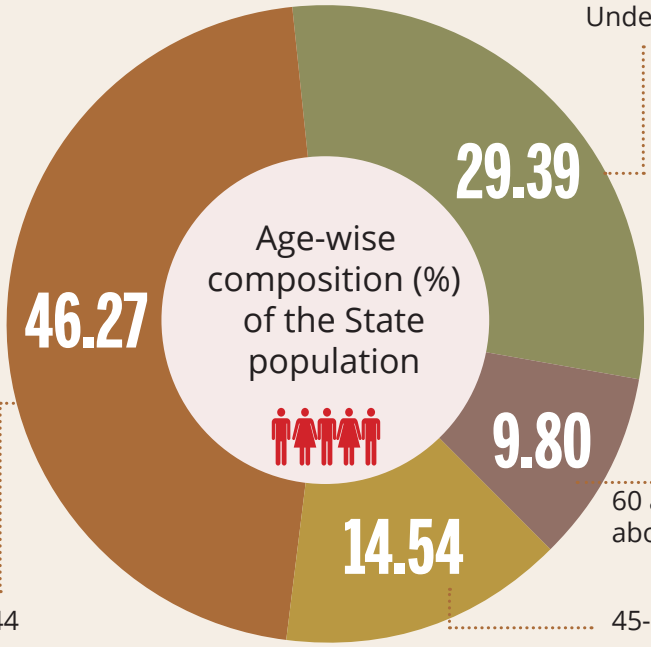
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Dedicated funds to upgrade and strengthen of 50 bedded Community Health Centers to 250 bedded Hospital and 50 bedded Poly Clinic[6]
- **Parvarish Scheme for Covid Orphans:** The Scheme offers financial aid to children who either orphaned or lost one parent to COVID-19. A fixed deposit of INR 300,000 will be made for orphaned children, which can be withdrawn after 21 years of age. COVID-19 orphans living with their guardians or relatives and children who have lost one parent will receive monthly monetary support of INR 5,000 till age of 18 years. COVID-19 positive children in the UT will be provided with INR 2,500 for 3 months to meet their nutritional needs.[7]

# HARYANA

Total population
**29,483,000**




Population density
**666.86 per km²**

## HEALTH PROFILE

RANK AMONG
28
**13**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**25.7%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**76.9%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**10.4%**

**Above 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Diarrheal diseases
- Neonatal Disorders

Total deaths per 100,000 (2019)
**617.5**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**34.12**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.016
2. Dedicated COVID-19 Health Centres: .....0.072
3. Dedicated COVID-19 Care Centres:.....0.182
4. Dedicated COVID-19 Beds: .....8.070
5. COVID-19 Sample collection centres: .....0.227
6. COVID-19 Testing Laboratories: .....0.074
7. No. of Ventilators: .....0.189
8. No. of Blood Banks: .....0.043
9. No. of Physicians, nurses, midwives: .....26.68
10. No. of registered pharmacists: .....12.014
11. Vaccination sites: .....0.460

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 112.77
2. Number of Internet subscribers per 100 population: 59.33
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | Yes |
| Age-wise Segregation | No | No |

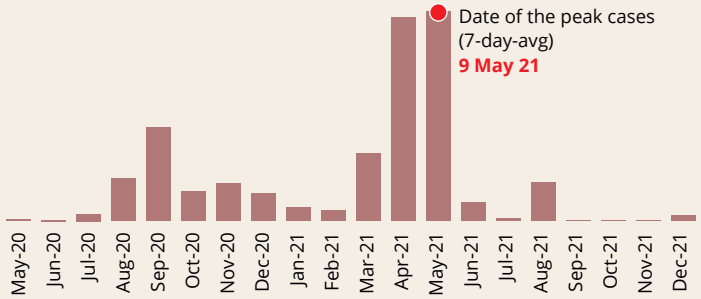
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | NA |
| If Bulletin available in English | Yes |

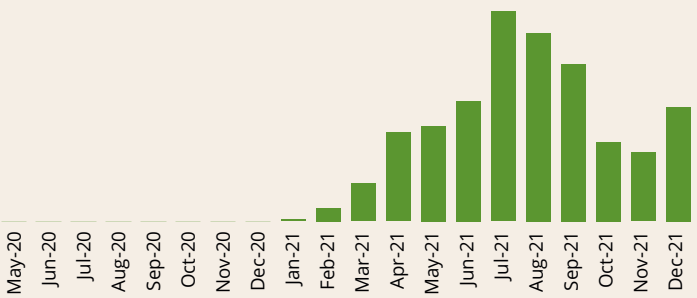
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Bhiwani bazaar app:** Developed by the district administration of Bhiwani, under the aegis of Haryana Govt. This app delivers groceries, fruits, vegetables, medicines etc at the doorstep during the lockdown, thereby reducing crowds.[8]
2. **Live Tracker App:** Developed by the Karnal Administration to track citizens who are at home quarantine[9].

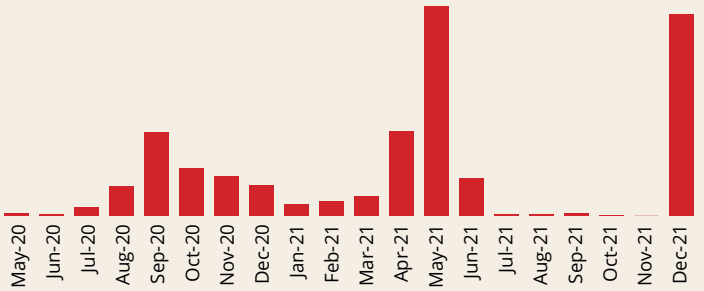
MONTHLY CASES



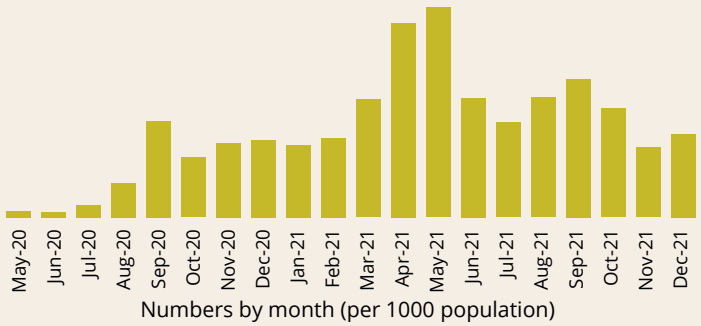

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

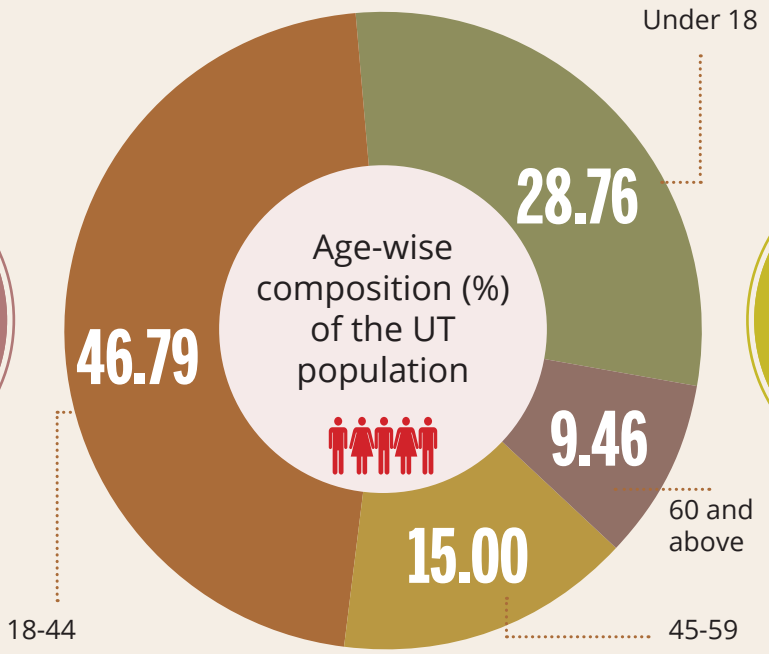
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Plasma banks were established in Gurugram, Panchkula, Rohtak, Karnal and Faridabad to ensure treatment through Plasma Therapy.
- The state government sanctioned the establishment of 1,000 Health Wellness Centres (HWCs) under the AYUSH Department. These facilities will provide services ranging from curative and palliative care, diet consultation, meditation and physical exercises along with testing facilities.
- The government has proposed the setting up of a National Institute of Ayurveda in Panchkula, University of Health Sciences at Karnal, Shri Atal Bihari Vajpayee Government Medical College in Faridabad and Dr. Mangal Sen Government Medical College in Bhiwani as an upgrade to the DH. Medical Colleges are also planned for the districts of Yamunanagar, Kaithal and Sirsa.

# LADAKH

Total population
**297,000**




Population density
**5.02 per km²**

## HEALTH PROFILE

RANK AMONG
8
**6**

SDG 3
(GOOD HEALTH & WELL BEING)
INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**52%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**94.9%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**18.6%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Lower Respiratory Infections
- Road Injuries

Total deaths per 100,000 (2019)
**566.25**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**72.73**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.101
2. Dedicated COVID-19 Health Centres: .....0.000
3. Dedicated COVID-19 Care Centres:.....0.067
4. Dedicated COVID-19 Beds: .....33.434
5. COVID-19 Sample collection centres: .....1.145
6. COVID-19 Testing Laboratories: .....0.471
7. No. of Ventilators: .....4.377
8. No. of Blood Banks: ..... NA
9. No. of Physicians, nurses, midwives: .....15.76
10. No. of registered pharmacists: ..... NA
11. Vaccination sites: .....0.539

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 153.2
2. Number of Internet subscribers per 100 population: 55.23
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

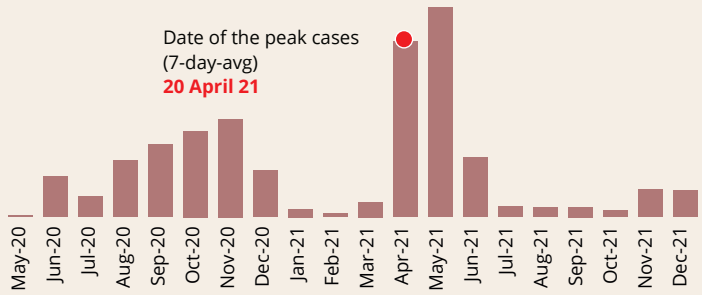
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | No |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | No |
| If Bulletin available in English | Yes |

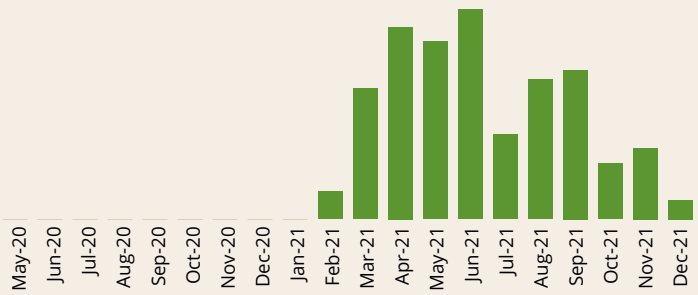
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **ITIHAS:** Developed by NIC J&K and Ladakh. ITIHAS helped in making forecast of Street level hotspots and taking preventive measures to control the spread of virus.[11]

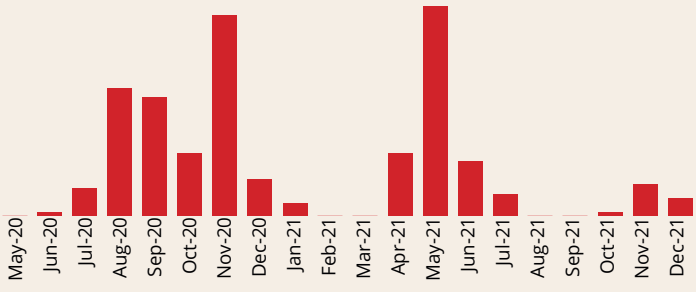
### MONTHLY CASES



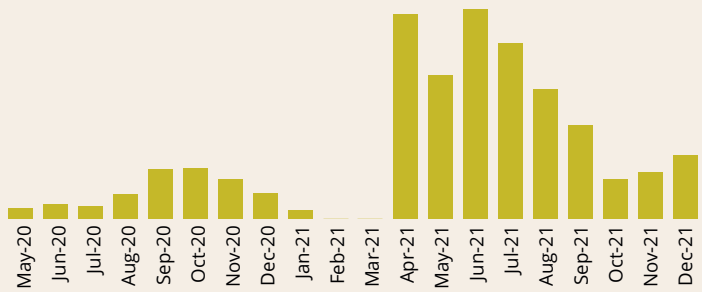

### MONTHLY VACCINATIONS




### MONTHLY DEATHS



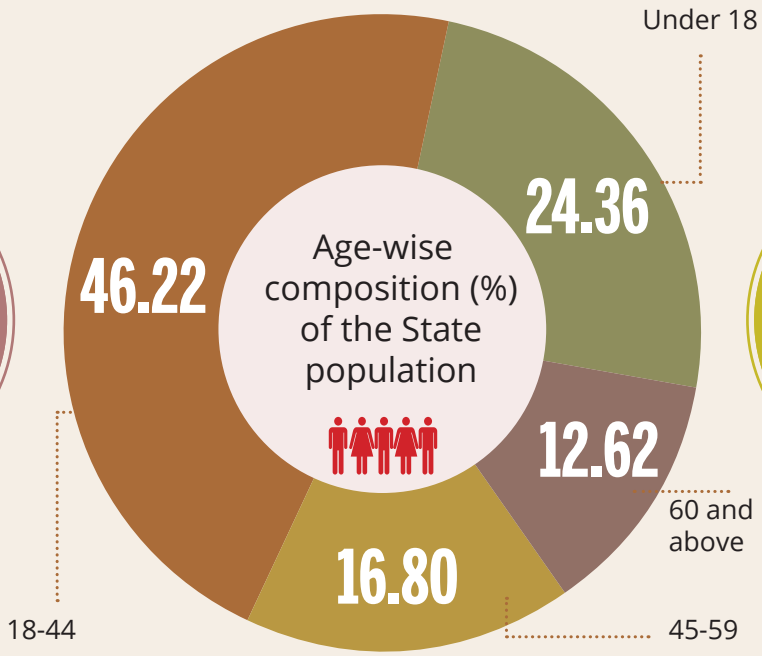

### MONTHLY TESTS




Numbers by month (per 1000 population)

# PUNJAB

Total population
**30,336,000**




Population density
**602.36 per km²**

## HEALTH PROFILE

RANK AMONG
28
**8**

SDG 3
(GOOD HEALTH & WELL BEING)
INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**25.2%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**76.2%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**13.5%**

Above 0.7

Below 0.5
0.5 - 0.7
Above 0.7

**BARE NECESSITIES INDEX (BNI)**
unchanged since 2012

**TOP 5 CAUSES OF MORTALITY**

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Cirrhosis
- Neonatal Disorders

Total deaths per 100,000 (2019)
**702.5**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**54.80**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.033
2. Dedicated COVID-19 Health Centres: .....0.034
3. Dedicated COVID-19 Care Centres:.....0.023
4. Dedicated COVID-19 Beds: .....4.192
5. COVID-19 Sample collection centres: .....0.425
6. COVID-19 Testing Laboratories: .....0.061
7. No. of Ventilators: .....0.267
8. No. of Blood Banks: .....0.045
9. No. of Physicians, nurses, midwives: .....56.33
10. No. of registered pharmacists: .....16.181
11. Vaccination sites: .....0.556

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 112.77
2. Number of Internet subscribers per 100 population: 59.33
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | Yes |
| Age-wise Segregation | No | No |

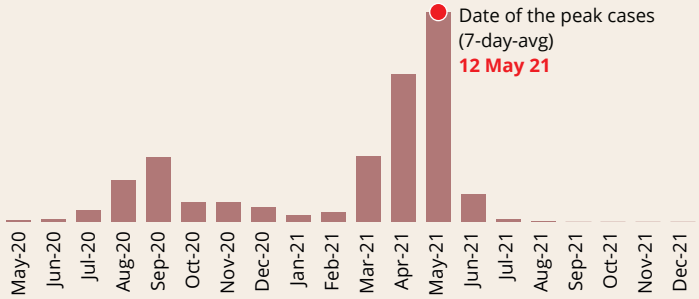
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | NA |
| If Bulletin available in English | Yes |

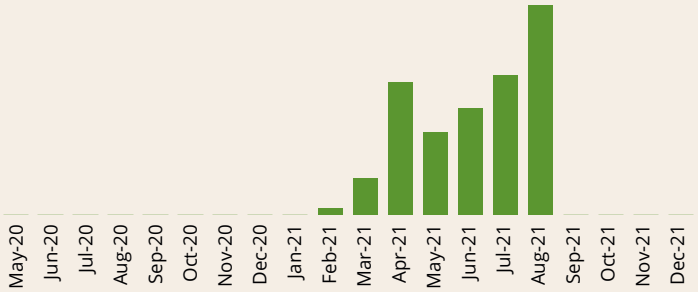
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **COVA Punjab:** One of the earliest states to launch a mobile application for COVID-19 management, COVA is available in English, Hindi and Punjabi. It employs geo-tagging and geo-fencing features to monitor patients in quarantine and provides real-time covid-related statistics in the state.[12]
2. **Ola CONNECTS:** Ola Connects is a technological platform launched by Ola to help in managing on-ground operations during COVID-19 Pandemic. Punjab Mandi Board used this platform for tracking and monitoring farmers.[13]

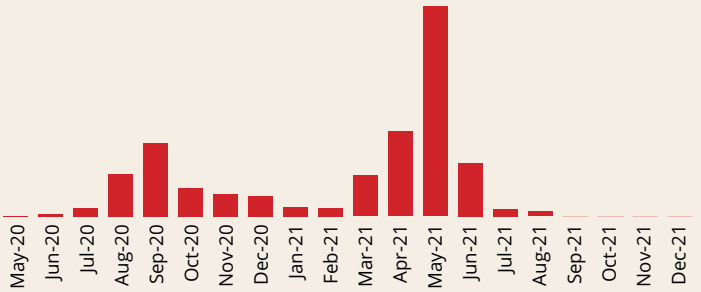
MONTHLY CASES



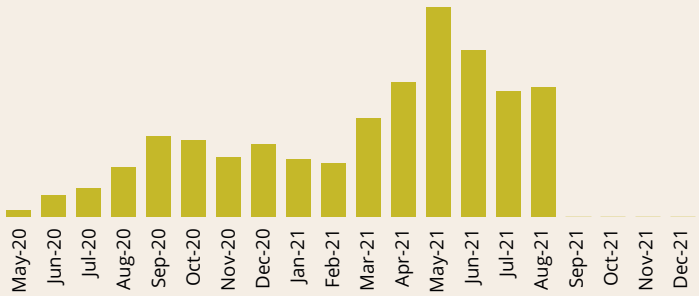

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

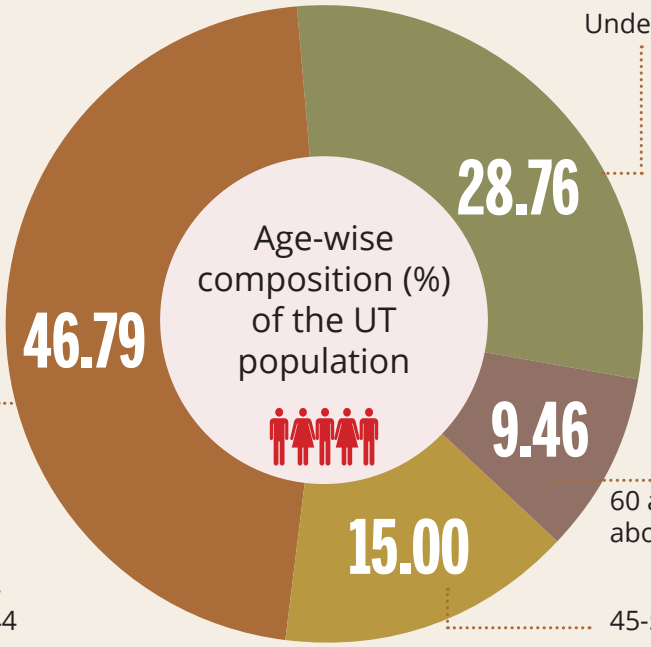
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Construction of 8 new maternal and child health divisions have been approved at the Sub-divisional hospitals of Talwandi sabo, Nabha, Patti and Derabassi, CHCs of Bhawanigarh and Raikot and DHs of Muktsar and Gurdaspur
- INR 1,000 M is dedicated to upgradation of overall health infrastructure, INR 1,340 for HWCs and INR 920 for Government Medical College at Patiala
- INR 800 M to establish a new medical college and Hospital at Kapurthala and another one at Hoshiarpur

# JAMMU AND KASHMIR

Total population
**13,408,000**




Population density
**317.42 per km²**

## HEALTH PROFILE

**RANK AMONG 8**
**5**
SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**12.7%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**86.2%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**18.6%**

**0.5 - 0.7**
Below 0.5 | 0.5 - 0.7 | Above 0.7
BARE NECESSITIES INDEX (BNI)
unchanged since 2012

**TOP 5 CAUSES OF MORTALITY**
- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Lower Respiratory Infections
- Road Injuries

Total deaths per 100,000 (2019)
**566.25**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**33.58**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.007
2. Dedicated COVID-19 Health Centres: .....0.029
3. Dedicated COVID-19 Care Centres:.....0.185
4. Dedicated COVID-19 Beds: .....1.945
5. COVID-19 Sample collection centres: .....0.559
6. COVID-19 Testing Laboratories: .....0.127
7. No. of Ventilators: .....0.665
8. No. of Blood Banks: .....0.027
9. No. of Physicians, nurses, midwives: .....66.17
10. No. of registered pharmacists: .....12.283
11. Vaccination sites: .....1.310

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 85.02
2. Number of Internet subscribers per 100 population: 55.23
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

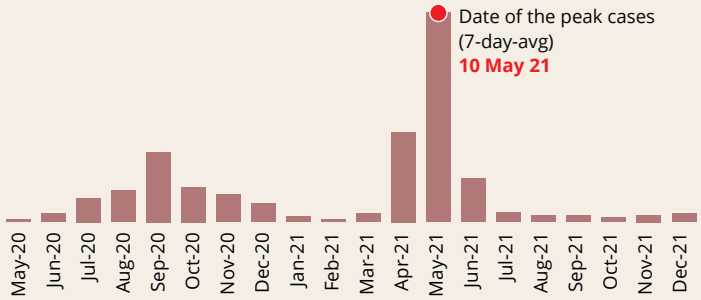
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

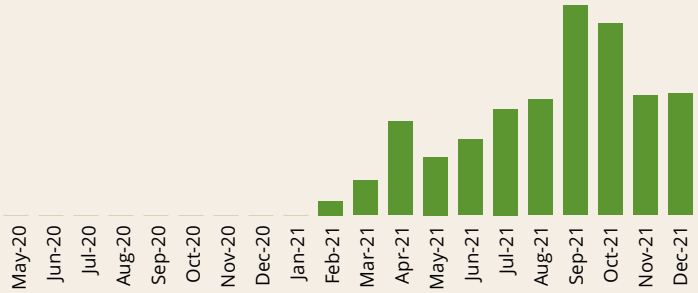
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. AurZuv Mobile App: Developed by District Administration of Budgam, Govt. of J&K. This helps the citizens know more about the available health facilities.[15]
2. NIC J&K started bulk SMS services for sending SMS to COVID19 Sampled persons on near real-time basis.[16]

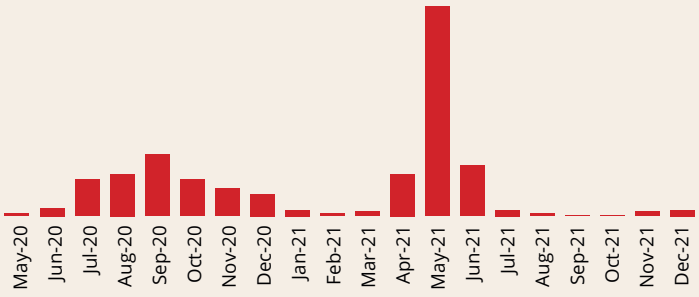
### MONTHLY CASES



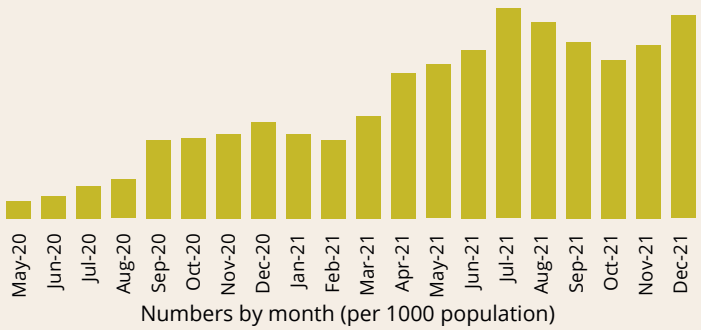

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

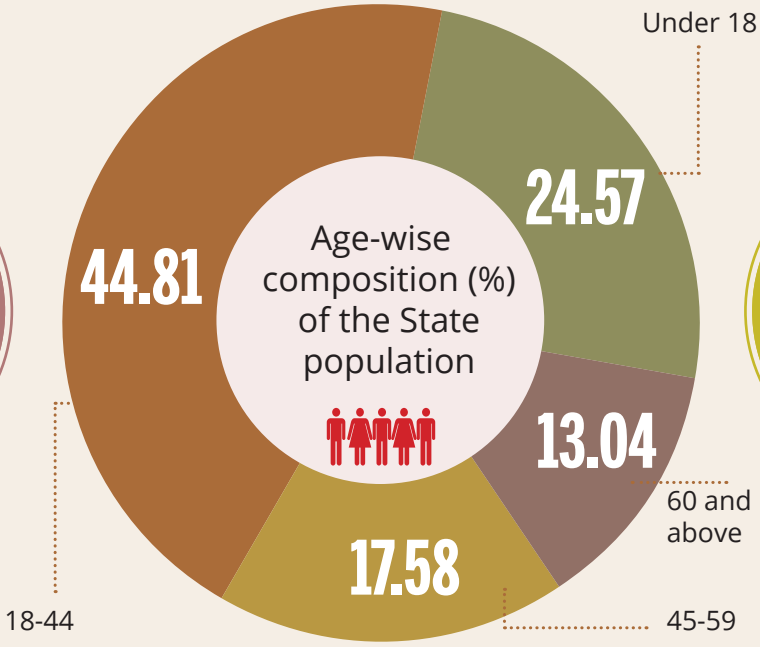
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 2,277 M is dedicated to setting up of 37 Oxygen Generation Plants will be established in all Medical colleges, Associated Hospitals and District Hospitals in the UT to manage the medical oxygen requirements.
- The World Bank is providing an aid of INR 3,675 M for the procurement of medical equipment and machinery for health facilities in the state
- INR 3,250 M each is allotted for the two new Medical colleges being constructed at Udhampur and Handwara. Two new AIIMS are also being planned for Jammu and Kashmir for the next financial year.
- Five new Nursing colleges are also being set up at Anantnag, Baramulla, Sopore, Gangyal and Kishtwar

# HIMACHAL PRADESH

Total population
**7,394,000**




Population density
**132.81 per km²**

## HEALTH PROFILE

RANK AMONG
28
**5**

SDG 3
(GOOD HEALTH & WELL BEING)
INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**34.5%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**89.3%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**14.4%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Lower Respiratory Infections
- Tuberculosis

Total deaths per 100,000 (2019)
**737.8**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**52.03**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.008
2. Dedicated COVID-19 Health Centres: .....0.015
3. Dedicated COVID-19 Care Centres:.....0.066
4. Dedicated COVID-19 Beds: .....4.800
5. COVID-19 Sample collection centres: .....0.559
6. COVID-19 Testing Laboratories: .....0.127
7. No. of Ventilators: .....0.674
8. No. of Blood Banks: .....0.032
9. No. of Physicians, nurses, midwives: .....66.17
10. No. of registered pharmacists: .....12.283
11. Vaccination sites: .....0.860

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 145.83
2. Number of Internet subscribers per 100 population: 82.63
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

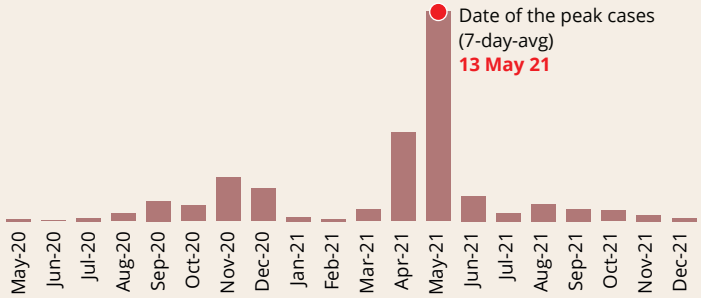
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | No |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

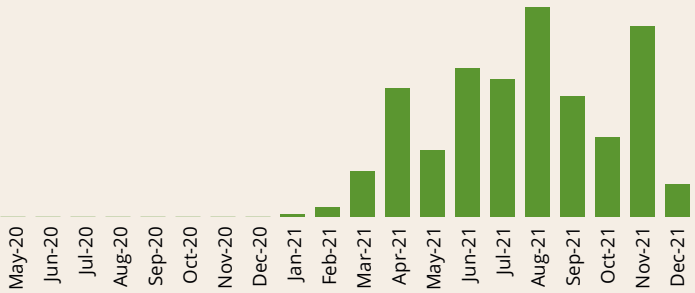
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Corona Mukt Himachal Mobile App:** For Tracking and monitoring COVID-19 suspects under home quarantine using GPS coordinates.
2. **COVID-19 ePass Verification App (Android based QR Code scanning app):** Developed by the Department of IT, it allows police persons at the inter-state barriers to verify the validity of ePasses by scanning the QR Codes. The app makes sure that the traffic moves smoothly and will avoid the long queues resulting from manual checking.

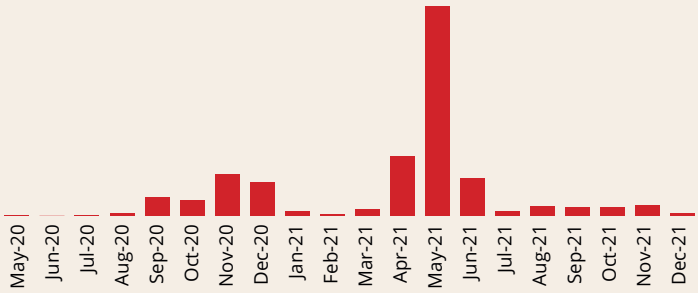
MONTHLY CASES



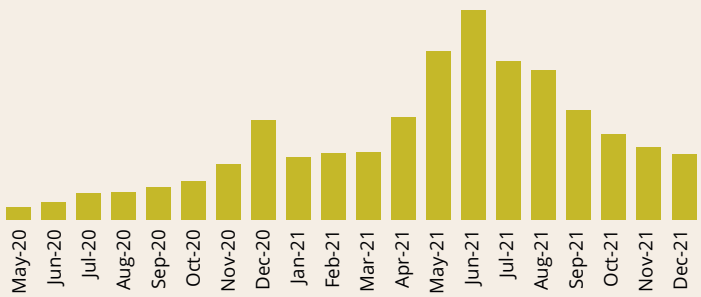

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

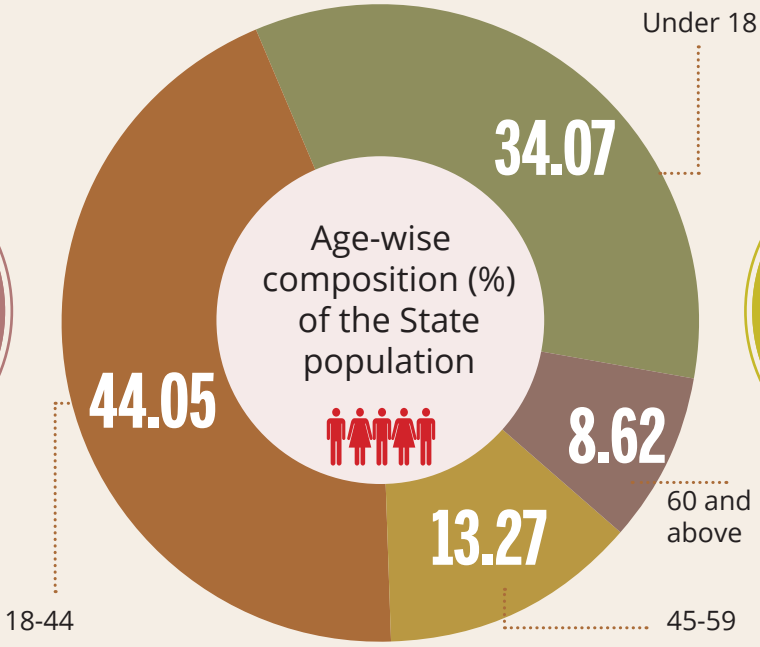
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Considering the role of ASHA workers as frontline workers against COVID-19, their honorarium was approved to increase by INR 750 per month in the state.
- INR 1,280 M is allotted to IGMC Shimla's new OPD Block and Trauma Centre which will begin functioning in 2021-22.
- INR 7720 M will be spent for the infrastructure upgrade in the State Medical Colleges at Shimla, Tanda, Nahan, Hamirpur, Chamba and Nerchowk.
- The Government aims to set up 143 AYUSH Wellness Centres across the state in 2021-22

# RAJASTHAN

Total population
**79,282,000**




Population density
**231.66 per km²**

## HEALTH PROFILE

**RANK AMONG**
**28**
**16**

**SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK**

Households with any usual member covered under a health insurance/ financing scheme
**87.8%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**80.4%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**11.8%**

**0.5 - 0.7**

Below 0.5 | 0.5 - 0.7 | Above 0.7

**BARE NECESSITIES INDEX (BNI)**
unchanged since 2012

**TOP 5 CAUSES OF MORTALITY**

- Chronic obstructive pulmonary disease
- Ischemic Heart Disease
- Lower Respiratory Infections
- Tuberculosis
- Neonatal Disorders

Total deaths per 100,000 (2019)
**664.91**

**COVID-19 deaths reported per 100,000 population**
(as of 15th Dec 2021)
**11.30**

# MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.007
2. Dedicated COVID-19 Health Centres: .....0.009
3. Dedicated COVID-19 Care Centres: .....0.036
4. Dedicated COVID-19 Beds: .....4.423
5. COVID-19 Sample collection centres: .....0.207
6. COVID-19 Testing Laboratories: .....0.031
7. No. of Ventilators: .....0.240
8. No. of Blood Banks: .....0.021
9. No. of Physicians, nurses, midwives: .....49.12
10. No. of registered pharmacists: .....6.501
11. Vaccination sites: .....0.891

# TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 81.89
2. Number of Internet subscribers per 100 population: 53.79
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

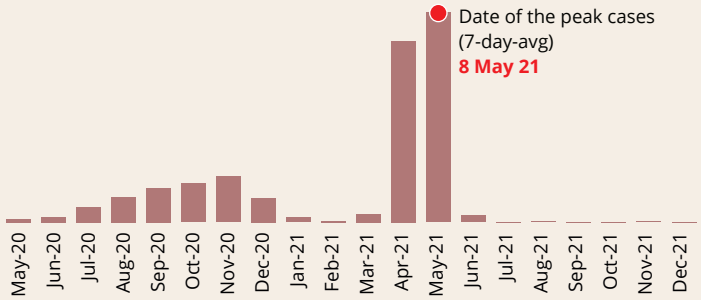
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | No |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | NA |
| If Bulletin available in English | Yes |

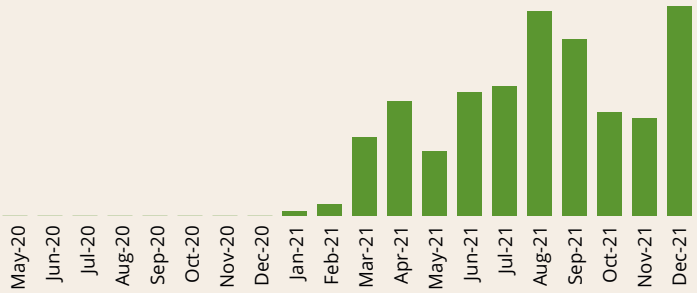
# GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Rajasthan Social Media Platform (RSMP):** Launched by the state government, it allows HCWs to collect survey information and map vulnerable households and find recipients for the Ayushmaan Bharat scheme during the pandemic.[20]

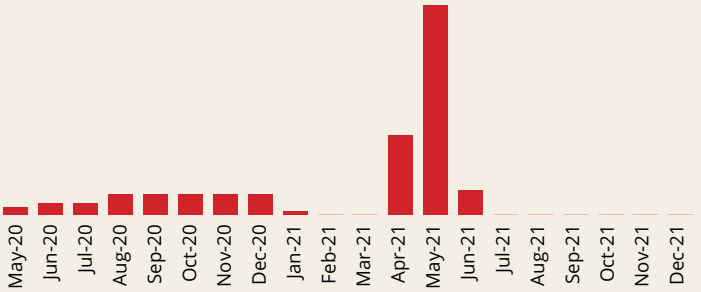
## MONTHLY CASES



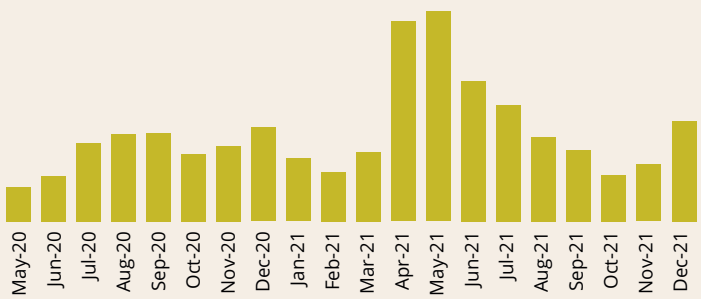

## MONTHLY VACCINATIONS




## MONTHLY DEATHS




## MONTHLY TESTS




Numbers by month (per 1000 population)

# GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

## HIGHLIGHTS

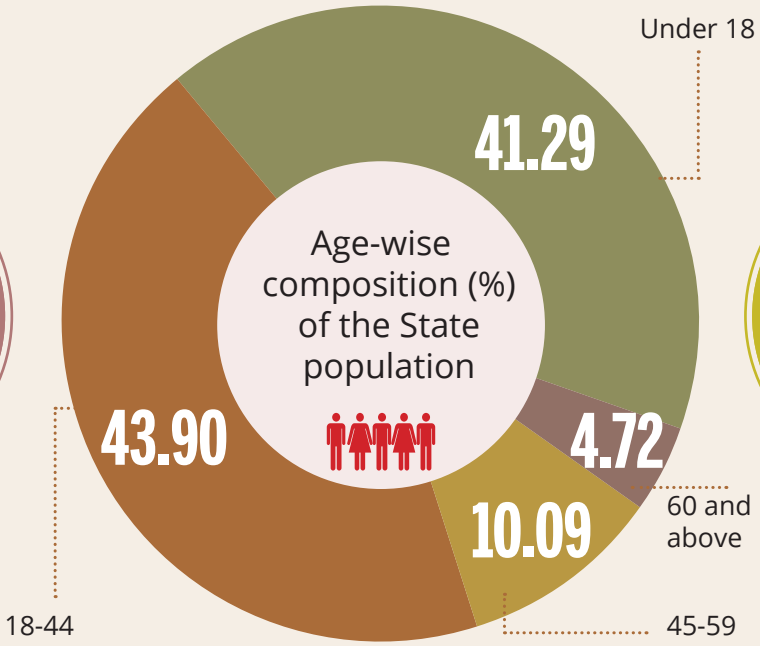
- In an attempt to bring Universal Health Coverage in the state, the government plans to implement the Rajasthan Model of Public Health. It begins with the soon introduction of the Right to Health Bill and INR 35,000 M allotment to provide health insurance to each family in the state. It also provisions free cashless treatment in government and private medical institutions for contractual workers, small/marginal farmers.
- An Institute of Tropical Medicine and Virology will be established in Jaipur for screening, treatment and research infectious diseases under one roof.
- 30 new PHC will be established, along with upgrading 50 PHCs to CHCs using an expenditure of about INR 2,000 M. A Satellite Hospital at Sanganer-Jaipur and new CHCs will be opened Dausa and Ranoli and.
- Sanctioned new hospital buildings to increase bed capacity across the state : 205 beds at Mahatma Gandhi Hospital, Bilwara (INR 710 M), 300 beds at Shri Kalyan Government Hospital, Sikar (INR 900 M), 250 beds at RBM Hospital, Bharatpur (INR 870 M), 380 beds at DH, Pali (INR 1,450 M), 370 beds at DH, Churu (INR 1,290 M) and 360 beds at DH, Barmer (INR 1,260 M),
- 1,000 Ayurveda Dispensaries will be upgraded to HWCs

# NORTH-EAST INDIA

Arunachal Pradesh, Assam, Manipur, Meghalaya,
Mizoram, Nagaland, Sikkim, Tripura

# ARUNACHAL PRADESH

Total population
**1,533,000**




Population density
**18.2 per km²**

## HEALTH PROFILE

RANK AMONG
28
**22**

SDG 3
(GOOD HEALTH & WELL BEING)
INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**29.3%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**64.9%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**17%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Cirrhosis and Other Chronic Liver Diseases
- Ischemic Heart Disease
- Chronic Obstructive Pulmonary Disease
- Stroke
- Neonatal Disorders

Total deaths per 100,000 (2019)
**415.47**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**18.26**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.026
2. Dedicated COVID-19 Health Centres: .....0.209
3. Dedicated COVID-19 Care Centres: .....0.444
4. Dedicated COVID-19 Beds: .....80.607
5. COVID-19 Sample collection centres: .....0.815
6. COVID-19 Testing Laboratories: .....0.913
7. No. of Ventilators: .....0.372
8. No. of Blood Banks: .....0.085
9. No. of Physicians, nurses, midwives: .....21.62
10. No. of registered pharmacists: .....2.28
11. Vaccination sites: .....0.639

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 84
2. Number of Internet subscribers per 100 population: 52.34
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

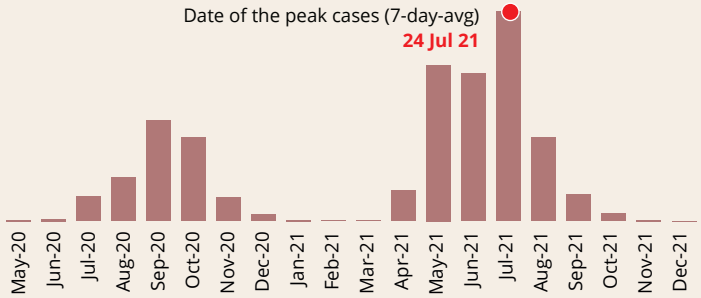
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

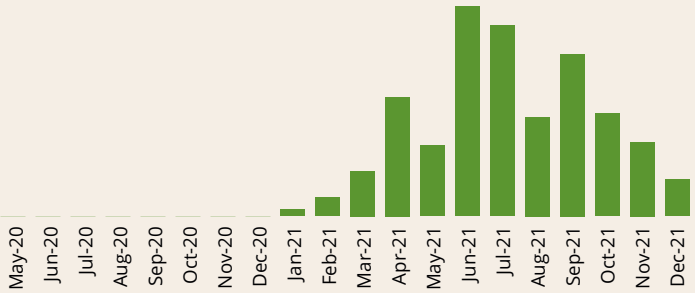
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Remote Learning Initiatives Online: Radio Schools and Classes on TV Channels:** The Department of Education from the state has collaborated with All India Radio to broadcast academic classes from 1 to 5pm on FM 103.1Mhz from Monday to Saturday, starting from June 2020 for classes 1 to 4. For Class 9 to 12 students, the classes are conducted per Kendriya Vidyalayas on local cable channels such as Airtel TV, Tata Sky, DISH TV, Videocon D2H and Swayam Prabha[1].
2. **COVID-19 Dashboard:** The state's online portal is a one-stop platform for reliable COVID-19-related information, including statistics and hospital or bed availability.[2]

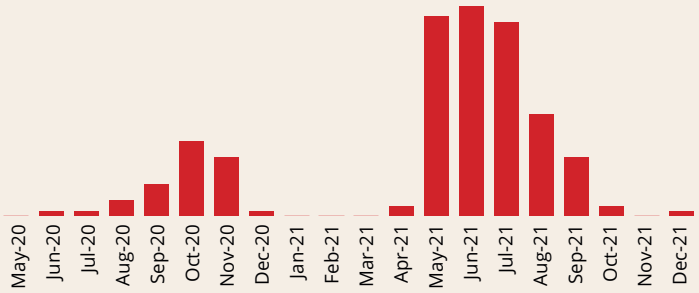
MONTHLY CASES



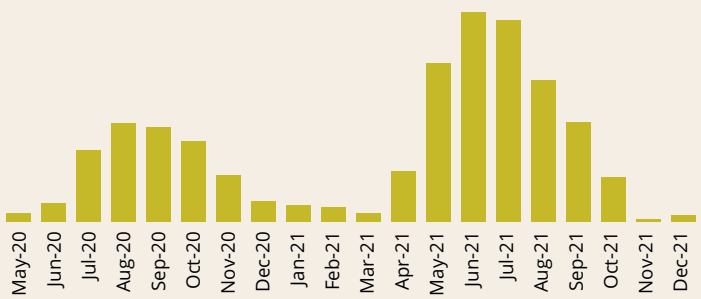

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

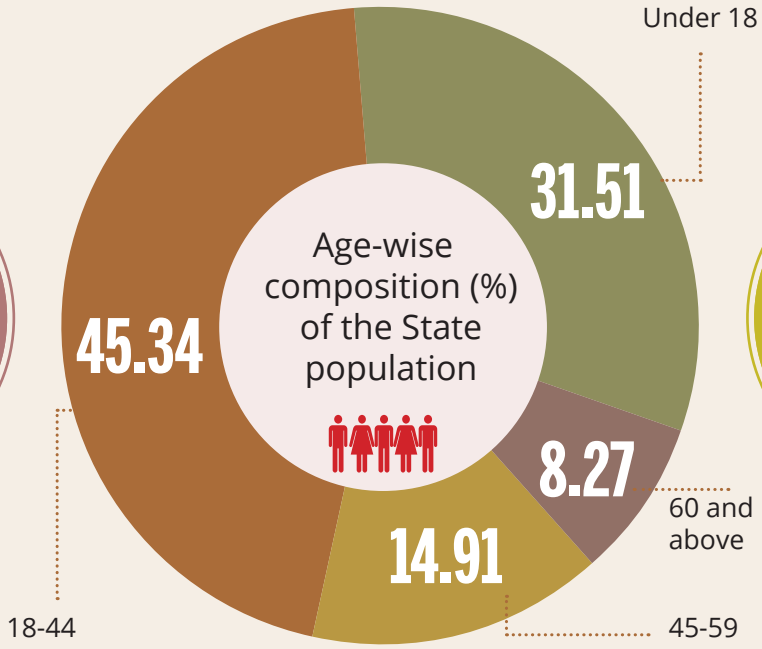
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 660 M was released in May of 2021 for COVID-19 expenditures from the State Disaster Response Fund, of which about 44% is to clear pending expenses from the pandemic and INR 175.7 M for purchasing testing kits.
- INR 200 M is proposed for a 200 Bed Hospital in Itanagar and INR 4500 M is proposed to upgrade District hospitals.
- INR 80 M has been allotted for FY 2021-22, as a part of a 2-years plan, to upgrade 320 Sub-Centres and 121 Public Health Centres to Health and Wellness Centres.
- Upgrade of Bakin Pertin General Hospital, Pasighat to a 300-bed hospital with a reserved amount of INR 50 M.

# ASSAM

Total population
**35,043,000**




Population density
**446.76 per km²**

## HEALTH PROFILE

RANK AMONG
28
**28**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**60%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**66.4%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**12.9%**

**0.5 - 0.7**

Below 0.5 | 0.5 - 0.7 | Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Stroke
- Chronic Obstructive Pulmonary Disease
- Ischemic Heart Disease
- Cirrhosis and Other Chronic Liver Diseases
- Diarrheal Diseases

Total deaths per 100,000 (2019)
**674.27**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**17.51**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.009
2. Dedicated COVID-19 Health Centres: .....0.040
3. Dedicated COVID-19 Care Centres: .....0.069
4. Dedicated COVID-19 Beds: .....5.872
5. COVID-19 Sample collection centres: .....0.304
6. COVID-19 Testing Laboratories: .....0.074
7. No. of Ventilators: .....0.277
8. No. of Blood Banks: .....0.023
9. No. of Physicians, nurses, midwives: .....22.57
10. No. of registered pharmacists: .....3.689
11. Vaccination sites: .....1.233

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 67.51
2. Number of Internet subscribers per 100 population: 41.57
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

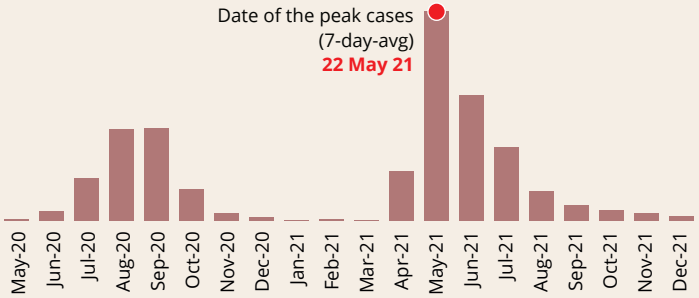
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | No |

| | |
|---|---|
| Beds/Hospital Data (Real time) | No |
| Social Media | Yes |
| If Bulletin available in English | Yes |

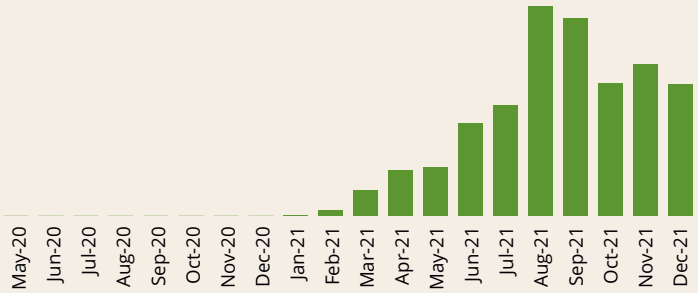
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Antflip Application:** Lakhimpur district administration created a mobile application to deliver groceries, vegetables and household goods.[5]
2. **COVASS Application:** It is an integrated platform for COVID-19 related information such as advisories, helpline, services and related assistance.[6]

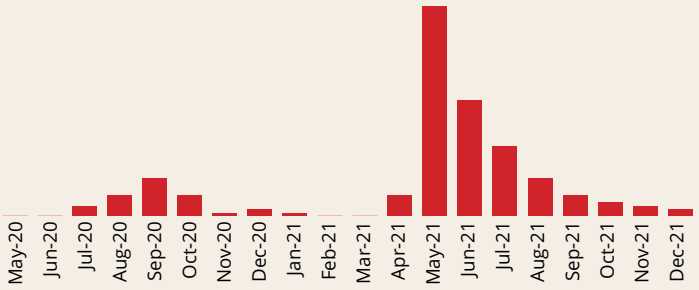
### MONTHLY CASES



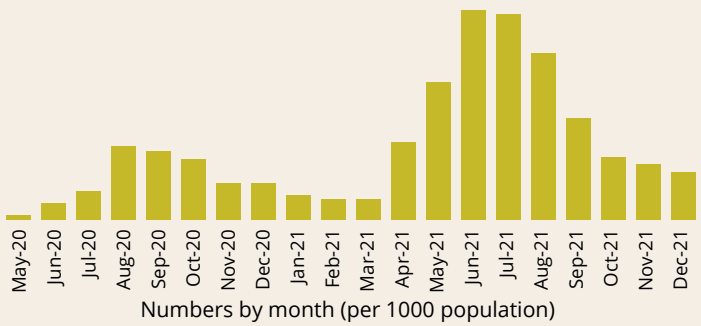

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS



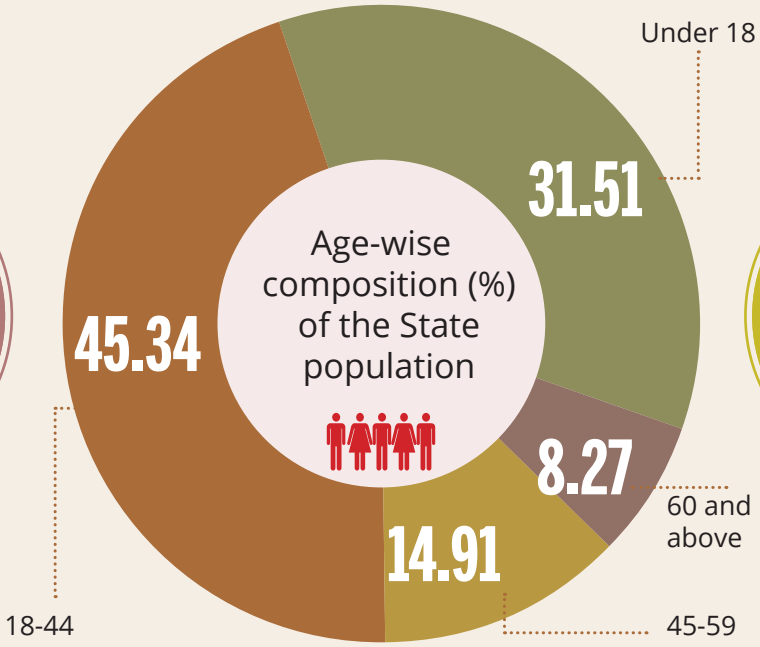

## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Until June 2021, 95,770 covid positive patients were provided free meals of worth INR 300
- Announcement of Chief Minister's Sishu Seva Scheme (INR 3,500 per month for orphans below 15 years of age) and COVID-19 Widow Support Scheme (INR 250,000 each)
- Upgrade of services and appointment of doctors across 1,000 Sub-Centers and HWCs to provide free medical consultation, diagnostic tests or treatment for primary diseases.
- INR 800 M dedicated to setting up 5 new medical colleges in Golaghat, Dhemaji, Morigaon, Bongaigaon and Tamulpur

# MANIPUR

Total population
**3,165,000**




Population density
**141.76 per km²**

## HEALTH PROFILE

**RANK AMONG**
**28**
**17**

**SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK**

Households with any usual member covered under a health insurance/ financing scheme
**14.2%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**68.8%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**14.4%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

**BARE NECESSITIES INDEX (BNI)**
unchanged since 2012

**TOP 5 CAUSES OF MORTALITY**

- Stroke
- Ischemic Heart Disease
- Cirrhosis and Other Chronic Liver Diseases
- Chronic Obstructive Pulmonary Disease
- Tuberculosis

**565.5**

Total deaths per 100,000 (2019)

**COVID-19 deaths reported per 100,000 population**
(as of 15th Dec 2021)
**63.03**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.006
2. Dedicated COVID-19 Health Centres: .....0.051
3. Dedicated COVID-19 Care Centres: .....0.063
4. Dedicated COVID-19 Beds:.....11.460
5. COVID-19 Sample collection centres: .....0.455
6. COVID-19 Testing Laboratories: .....0.310
7. No. of Ventilators: .....0.676
8. No. of Blood Banks:..... 0.016
9. No. of Physicians, nurses, midwives: .....37.56
10. No. of registered pharmacists: .....4.5
11. Vaccination sites: .....0.322

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 72.97
2. Number of Internet subscribers per 100 population: 52.34
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | No |
| Age-wise Segregation | No | No |

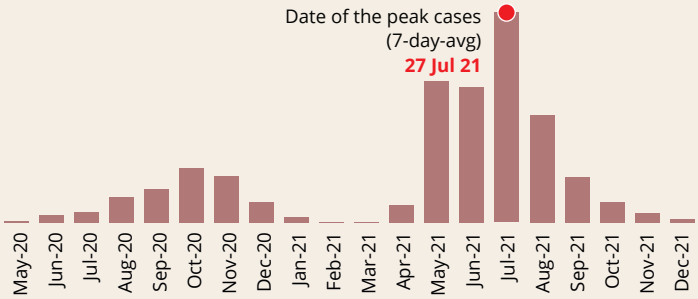
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

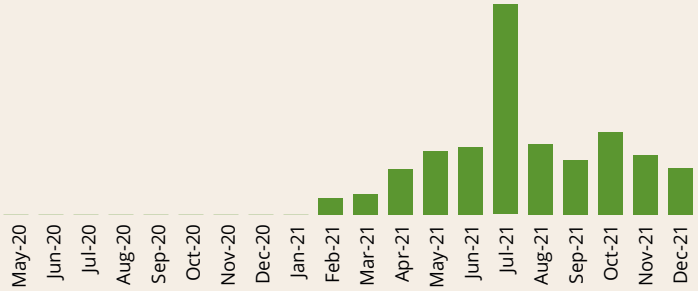
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. i-Drone (ICMR's Drone Response and Outreach in North-East): Make-in-India Drones were used to deliver vaccines, collect samples and more as a pilot in Manipur and Nagaland in hard-to-reach terrains of the region.[8]

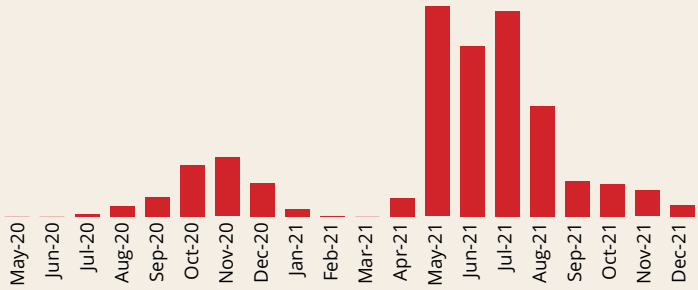
MONTHLY CASES



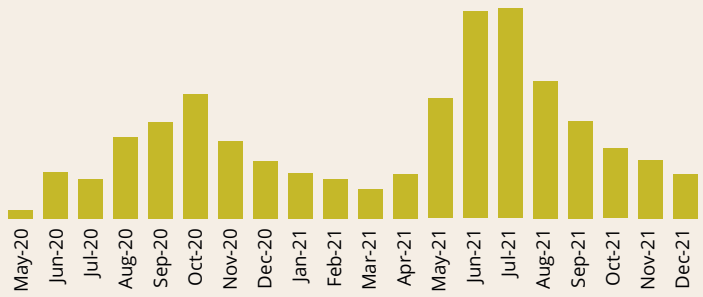

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS



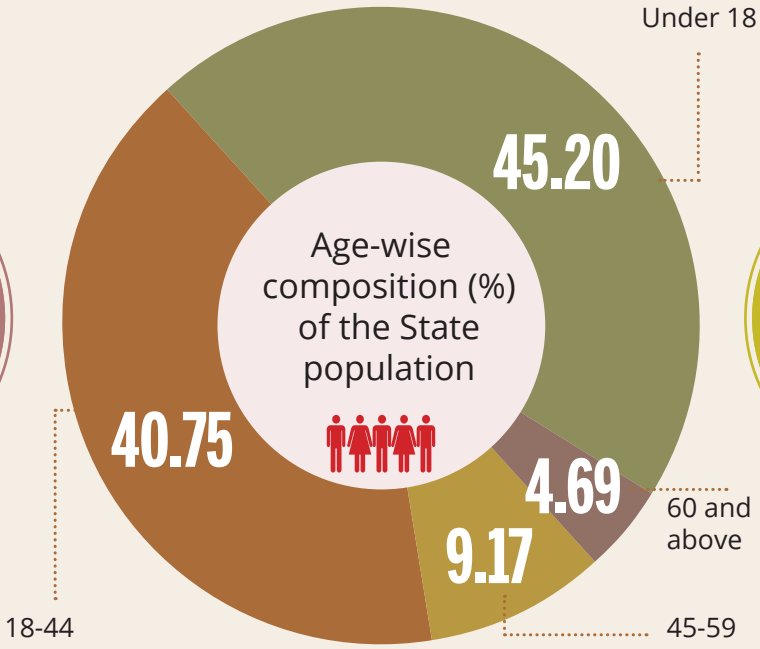

## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- State budget for telemedicine services increased from INR 30 M to INR 270 M
- The expansion of Jawaharlal Nehru Institute of Medical Sciences received an aid of INR 1,700 M.

# MEGHALAYA

Total population
**3,288,000**




Population density
**146.60 per km²**

## HEALTH PROFILE

RANK AMONG
28
**15**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**63.5%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**63.8%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**10.7%**

**0.5 - 0.7**

Below 0.5 | 0.5 - 0.7 | Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Stroke
- Ischemic Heart Disease
- Lower Respiratory Infections
- Tuberculosis
- Neonatal Disorders

Total deaths per 100,000 (2019)
**467.85**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**44.92**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.021
2. Dedicated COVID-19 Health Centres: .....0.073
3. Dedicated COVID-19 Care Centres: .....0.082
4. Dedicated COVID-19 Beds: ..... 6.293
5. COVID-19 Sample collection centres: .....0.617
6. COVID-19 Testing Laboratories: .....0.268
7. No. of Ventilators: .....0.262
8. No. of Blood Banks: ..... 0.027
9. No. of Physicians, nurses, midwives: .....24.68
10. No. of registered pharmacists: .....2.69
11. Vaccination sites: .....0.833

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 70.23
2. Number of Internet subscribers per 100 population: 52.34
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

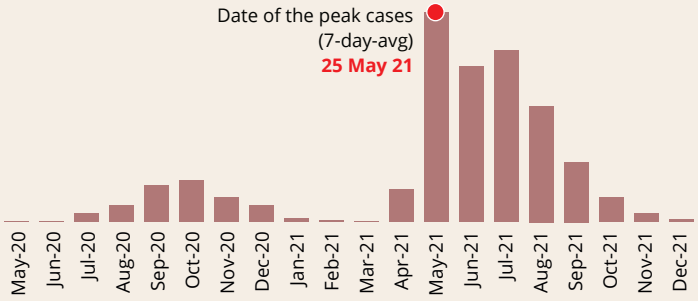
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

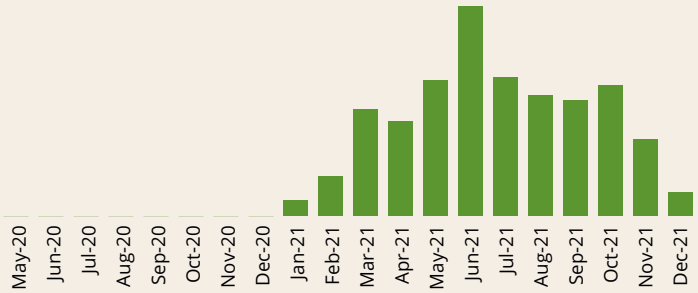
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Sankalp Dashboard**[10] **:** It is an integrated monitoring system to estimate the prevalence of COVID-19 symptoms to identify high-risk populations and people with persistent symptoms. The government mandated the state returnees to pre-register online on their web portal before arrival and follow-through screening. They were all monitored using IVRS calling facility and a Geo-Fencing application to trace movement for 14 days of quarantine.
2. **COVID-19 Dashboard**[11]**:** The Health & Family welfare department of the state have created a state dashboard for all information dissemination, data and outreach needs.

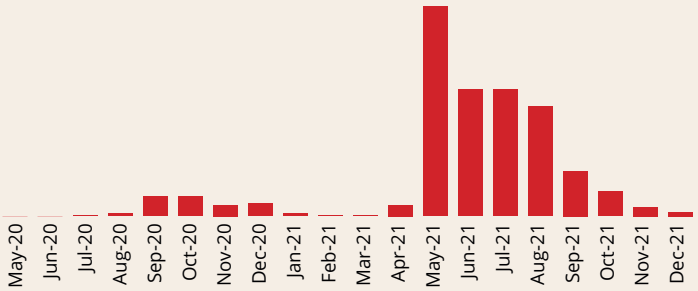
MONTHLY CASES



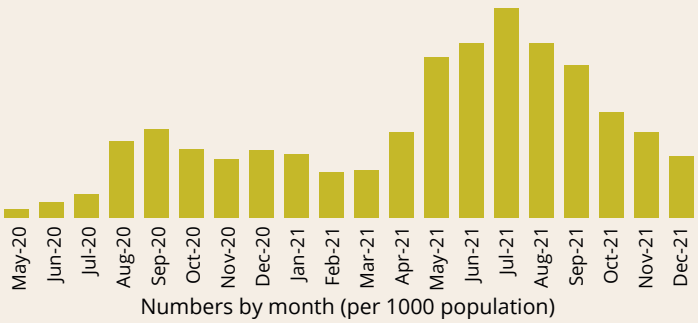

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

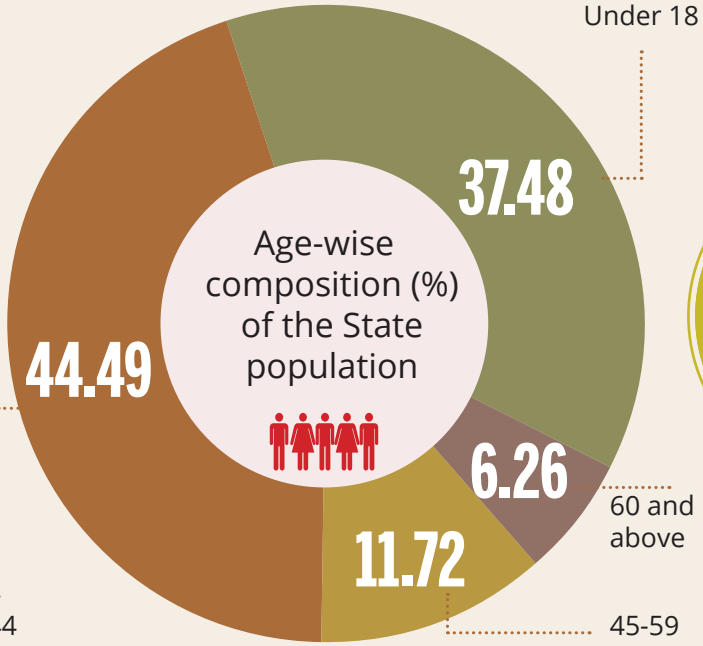
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 2,400 M was spent to manage the second wave of the novel coronavirus while INR 4,000 M was spent to address the first wave.[12]
- The state is working with the World Bank on the 'Meghalaya Health System Strengthening Project' to expand its health infrastructure. 659 Health centres (including District Hospitals, PHCs, CHCs and Sub-centres) will receive an investment of INR 3,700 M over the next three years. Out of this, INR 550 M is reserved for 2021-22.[13]

# MIZORAM

Total population
**1,216,000**




Population density
**57.68 per km²**

## HEALTH PROFILE

**RANK AMONG**
**28**
**4**

**SDG 3**
(GOOD HEALTH & WELL BEING)
**INDEX RANK**

Households with any usual member covered under a health insurance/ financing scheme
**46.4%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**72.5%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.9%**

**Above 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

**BARE NECESSITIES INDEX (BNI)**
changed from Yellow in 2012

**TOP 5 CAUSES OF MORTALITY**

- Chronic obstructive pulmonary disease
- Lower Respiratory Infections
- Human Immunodeficiency Virus
- Neonatal Disorders
- Lung Cancer

**535.37**

Total deaths per 100,000 (2019)

**COVID-19 deaths reported per 100,000 population**
(as of 15th Dec 2021)
**45.72**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.008
2. Dedicated COVID-19 Health Centres: .....0.123
3. Dedicated COVID-19 Care Centres: .....0.329
4. Dedicated COVID-19 Beds: .....3.207
5. COVID-19 Sample collection centres: .....0.263
6. COVID-19 Testing Laboratories: .....0.428
7. No. of Ventilators: .....0.946
8. No. of Blood Banks: .....0.090
9. No. of Physicians, nurses, midwives: .....49.91
10. No. of registered pharmacists: .....3.72
11. Vaccination sites: .....0.173

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 109.73
2. Number of Internet subscribers per 100 population: 52.34
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | No |
| Age-wise Segregation | No | No |

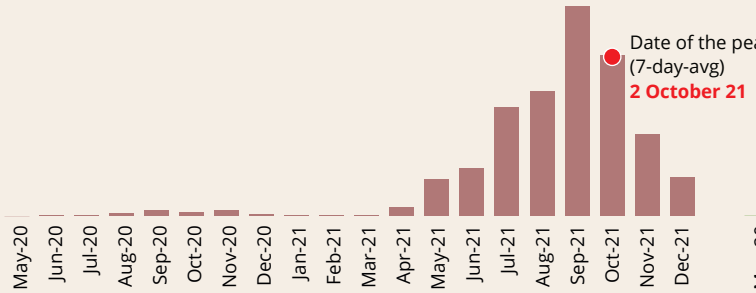
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | No |
| Social Media | Yes |
| If Bulletin available in English | Yes |

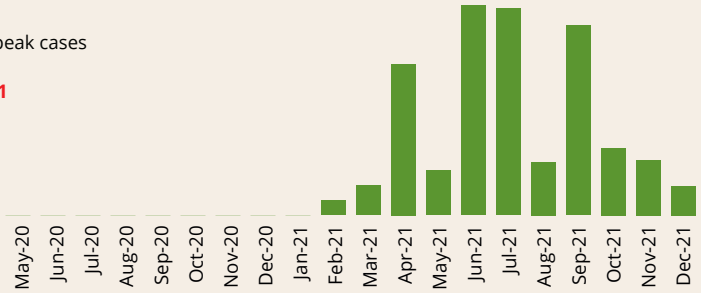
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **m-Covid19:** It is a mobile-based application by the state government that tracks COVID-19 cases in quarantine. Further, it provides government advisories and updates, facilitates volunteer recruitment and issues mPass to permit movement.[14]
2. **Mizoram Remote Sensing Application Centre Dashboard:** It is an online platform for crucial public information dissemination on COVID-19 in the state and is a collaborative effort with the Environmental Systems Research Institute (ESRI). It uses geographical information system (GIS) technology to monitor its health facilities.[15]

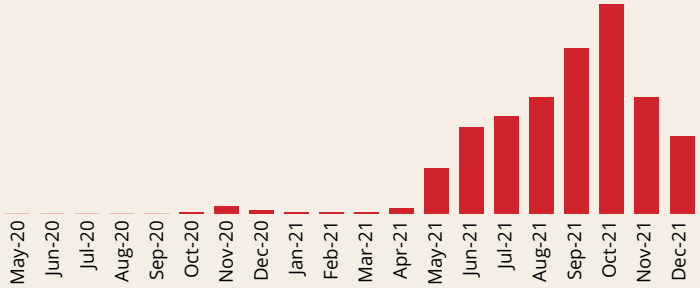
MONTHLY CASES



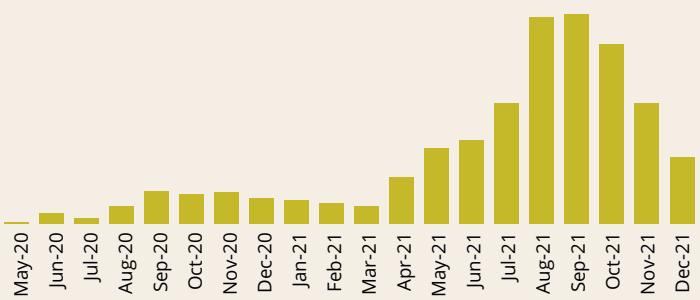

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

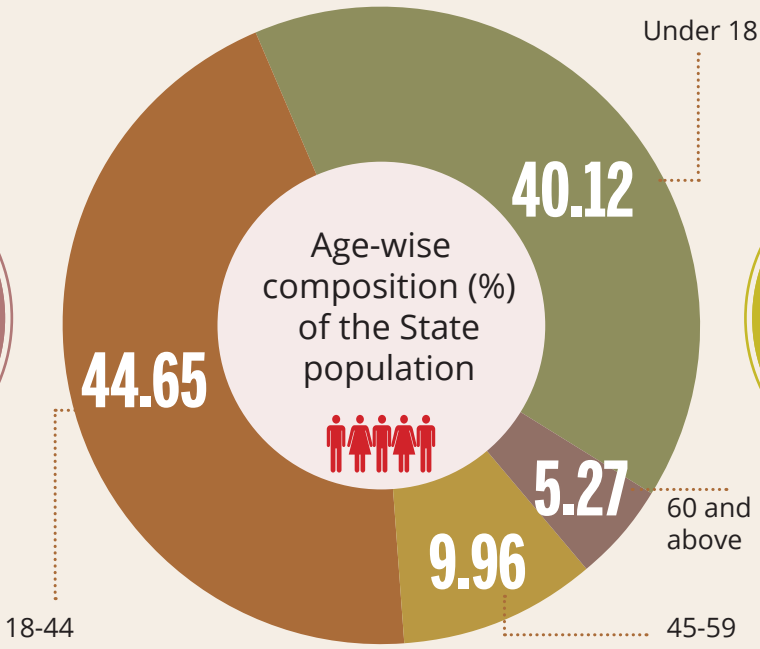
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 470 M was allocated by the Centre for State Disaster Risk Management. The state proposed to contribute a matching share of 10%.
- INR 600 M is proposed for COVID-19 expenditure from the MLA Local Area Development Fund.

# NAGALAND

Total population
**2,192,000**




Population density
**132.22 per km²**

## HEALTH PROFILE

RANK AMONG
28
**25**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**20.5%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**57.9%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**7.9%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
Yellow in 2012

**TOP 5 CAUSES OF MORTALITY**

- Stroke
- Ischemic Heart Disease
- Lower Respiratory Infections
- Cirrhosis and Other Chronic Liver Diseases
- Chronic Obstructive Pulmonary Disease

Total deaths per 100,000 (2019)
**521.59**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**31.93**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.055
2. Dedicated COVID-19 Health Centres: .....0.005
3. Dedicated COVID-19 Care Centres: .....0.005
4. Dedicated COVID-19 Beds: .....2.906
5. COVID-19 Sample collection centres: .....0.525
6. COVID-19 Testing Laboratories: .....0.319
7. No. of Ventilators: .....0.766
8. No. of Blood Banks: .....0.023
9. No. of Physicians, nurses, midwives: .....1.11
10. No. of registered pharmacists: .....6.90
11. Vaccination sites: .....0.224

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 74.27
2. Number of Internet subscribers per 100 population: 52.34
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | Yes |
| Age-wise Segregation | Yes | Yes |

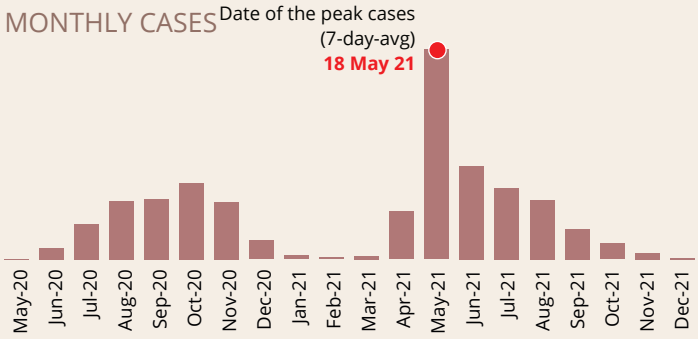
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | No |
| Social Media | Yes |
| If Bulletin available in English | Yes |

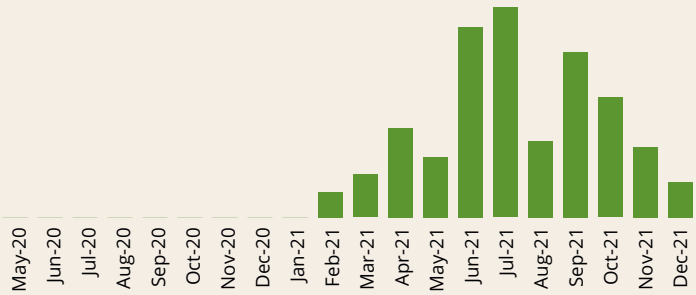
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **COVID-19 Mobile Application:** In June 2021, the state launched its mobile application to effectively share COVID-19 related information and combat fake news/rumours. A self-assessment feature will be an upcoming addition to ascertain if medical help is needed for a tentative diagnosis.[17]
2. **NISHTHA Tele-Track Isolation Care Platform:** With technical assistance from USAID, the State Government launched a tech-enabled isolation care model to monitor and follow-up COVID-19 positive patients in Kohima and Dimapur. The tele-consultation feature gives patients access to physicians, mental health experts and diet counsellors.[18]
3. **TruNat System:** A comprehensive assay for screening and confirmation of Covid19 cases has been procured by the government. Biosafety Level II and III Laboratories are now operational in Kohima and Tuensang.[19]

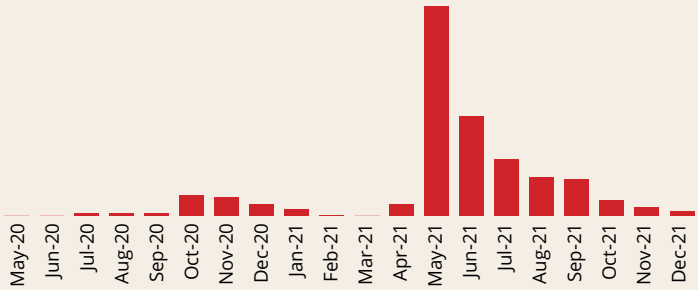
MONTHLY CASES



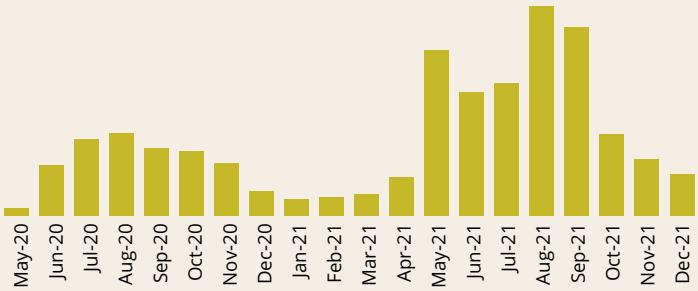

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

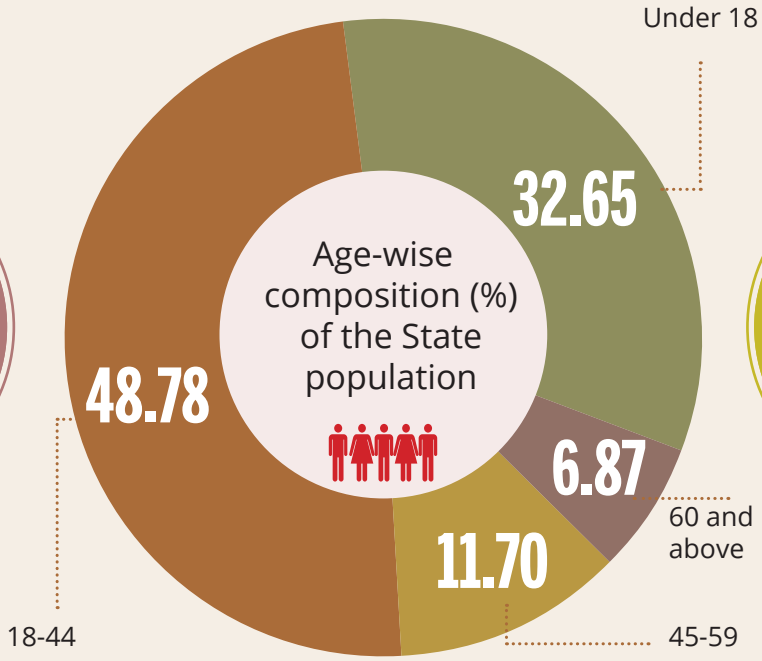
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 25 M has been earmarked for the expansion of a new ward at Nagaland Hospital Authority (NHA), Kohima and INR 15 M for the construction a 50-bedded District Hospital.
- INR 5 M has been dedicated from each Legislative Assembly Constituency – ADF 2020-21 to strengthen health systems and infrastructure, quarantine facilities and promote allied activities to combat the pandemic
- INR 3,250 M is the estimated expenditure for starting the Kohima Medical College at the NHA and another Medical College at Mon.

# SIKKIM

Total population
677,000




Population density
95.41 per km²

## HEALTH PROFILE

RANK AMONG
28
24
SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
25.7%

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
80.6%

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
NA

Above 0.7
Below 0.5
0.5 - 0.7
Above 0.7
BARE NECESSITIES INDEX (BNI)
changed from Yellow in 2012

TOP 5 CAUSES OF MORTALITY
- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Cirrhosis and Other Chronic Liver Diseases
- Lower Respiratory Infections
- Stroke

Total deaths per 100,000 (2019)
512.16

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
61.00

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.015
2. Dedicated COVID-19 Health Centres: .....0.044
3. Dedicated COVID-19 Care Centres: .....0.148
4. Dedicated COVID-19 Beds: .....4.860
5. COVID-19 Sample collection centres: .....1.507
6. COVID-19 Testing Laboratories: .....0.369
7. No. of Ventilators: .....0.000
8. No. of Blood Banks: .....0.089
9. No. of Physicians, nurses, midwives: .....24.52
10. No. of registered pharmacists: .....4.07
11. Vaccination sites: .....0.222

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 99.44
2. Number of Internet subscribers per 100 population: 51.74
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

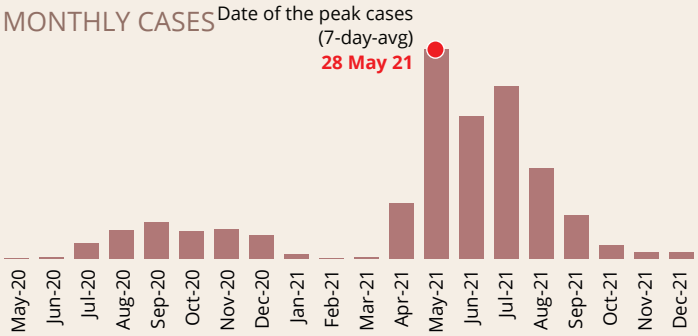
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | No |
| Social Media | No |
| If Bulletin available in English | Yes |

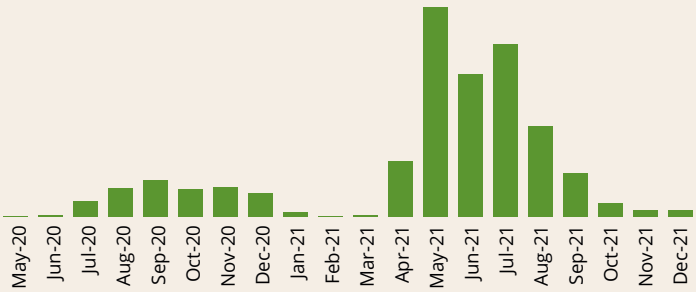
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **COVID-19 Portal:** The state's online portal is a one-stop platform for reliable and latest information on COVID-19 statistics, beds availability, hospitals, treatment protocols, health screening status, mental health screening guidelines and more.[21]

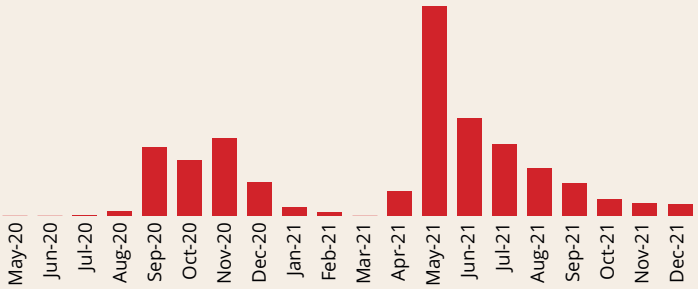
MONTHLY CASES



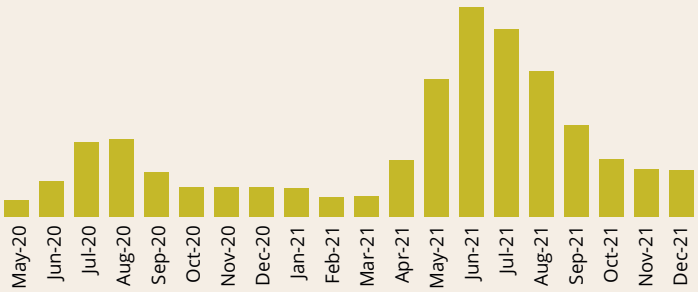

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

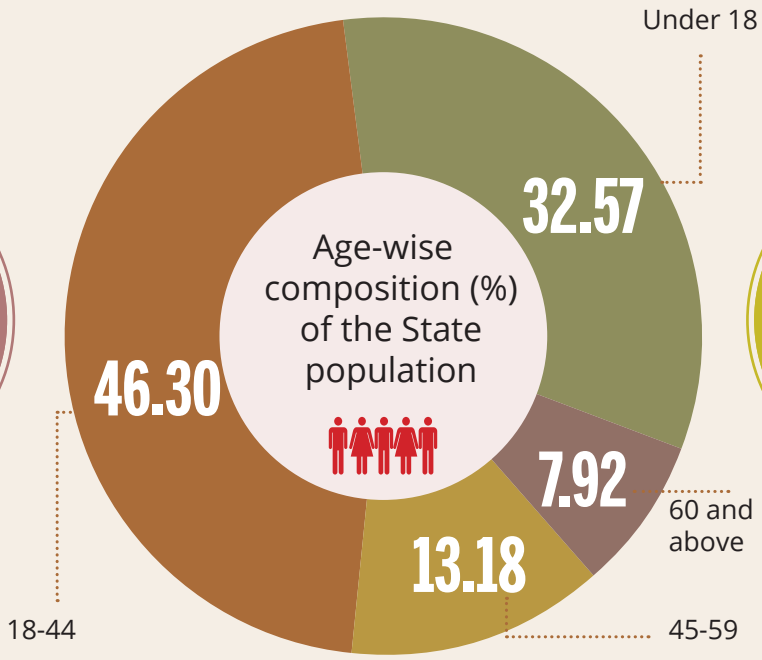
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- A 50 bedded COVID-19 hospital for South and West Districts is under construction at Karfectar as a preparation for future waves
- A Community Health Centre (CHC) is being established at Soreng
- INR 45 M will be invested by the State to Sikkim Manipal Institute of Medical Sciences for 80 new MBBS seats in Gangtok
- The state received sanctioned funds from the Centre to manage its Oxygen requirements for COVID-19. A plant with a capacity of 500 Litres per minute capacity was set up at Sir Thutob Namgyal Memorial (STNM) Hospital, which helped during the second wave. Singtam district hospital and Army Hospital also now have plants with 200 and 500 litres per minute capacities respectively. Processes are underway to establish similar 500 litres capacity oxygen plants in Namchi and Mangan Hospitals.
- The State government has sanctioned an oxygen plant with a capacity of 1,000 Litres per minute in Rangpo.

# TRIPURA

Total population
**4,071,000**




Population density
**388.05 per km²**

## HEALTH PROFILE

RANK AMONG
28
**20**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**33%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**69.5%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**14.2%**

**Below 0.5**

Below 0.5 | 0.5 - 0.7 | Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Stroke
- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Lower Respiratory Infections
- Diarrheal Diseases

Total deaths per 100,000 (2019)
**642.88**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**20.24**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.002
2. Dedicated COVID-19 Health Centres: .....0.012
3. Dedicated COVID-19 Care Centres: .....0.052
4. Dedicated COVID-19 Beds: .....8.669
5. COVID-19 Sample collection centres: .....0.604
6. COVID-19 Testing Laboratories: .....0.182
7. No. of Ventilators: .....0.226
8. No. of Blood Banks: .....0.032
9. No. of Physicians, nurses, midwives: .....22.13
10. No. of registered pharmacists: .....11.38
11. Vaccination sites: .....1.710

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 75.78
2. Number of Internet subscribers per 100 population: 52.34
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

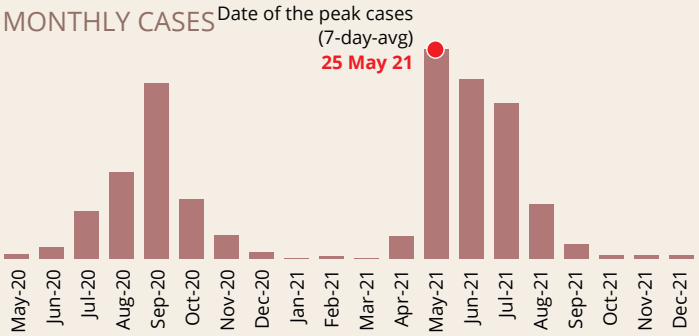
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

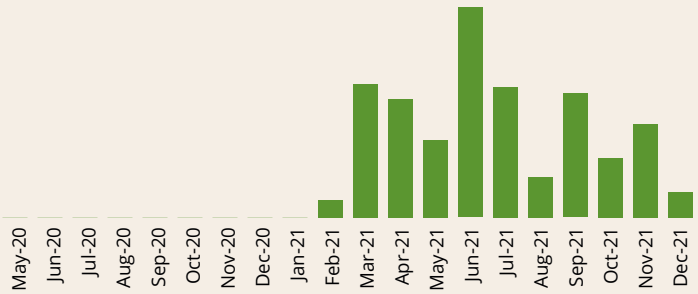
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

**Sanket: It is a compact, affordable and portable ECG device designed for remote locations. The state government and Tata Trust will make this device available in three districts covering all 39 PHCs to provide timely cardiac care through this initiative.[23]**

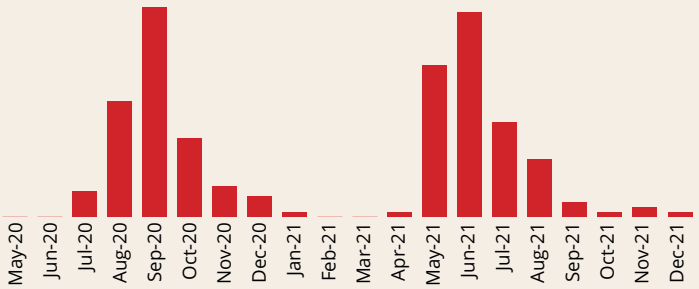
### MONTHLY CASES



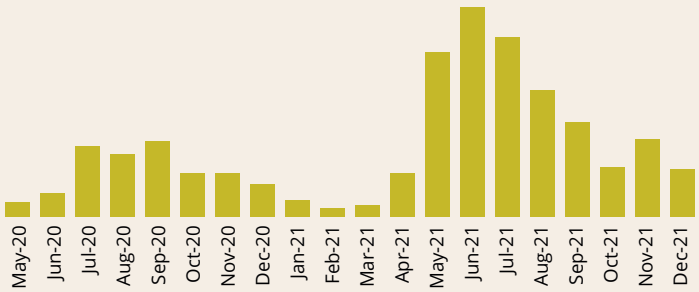

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

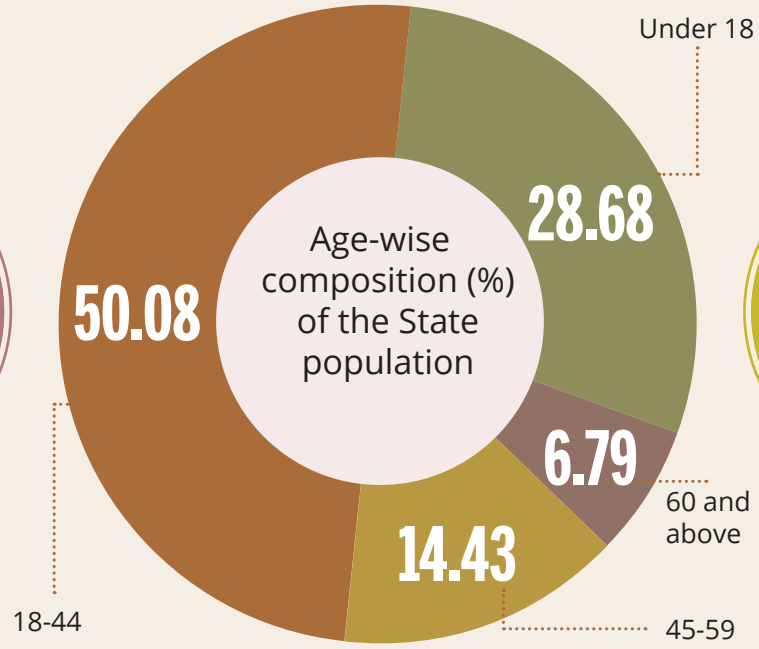
- INR 120 M and 44 M were donated to about 84,000 construction workers and Above Poverty Line (APL) families through the COVID-19 Emergency Relief Scheme.
- Construction of Trauma care facilities at District Hospitals in Dhalai, Dharmanagar, Udaipur, Tepania, Santribazar along with 100 bedded Sub-Divisional Hospital at Sabroom is sanctioned
- The upgrade of CHCs at Kumarghat, Panisagar and Karbook into 50-bed Sub-Divisional Hospitals are in progress
- PHCs in West Tripura, South Tripura and Dhalai districts have been upgraded to 10-bedded Hospitals
- Medical college seats have been increased for MBBS (25), PG (16) along with nursing seats (265) in BSc, MSc courses

# SOUTH INDIA

Andaman & Nicobar Islands, Andhra Pradesh, Karnataka, Kerala, Lakshadweep Islands, Puducherry, Tamil Nadu, Telangana

# ANDAMAN & NICOBAR ISLANDS

Total population
**400,000**




Population density
**48.49 per km²**

## HEALTH PROFILE

RANK AMONG
8
**8**

SDG 3
(GOOD HEALTH & WELL BEING)
INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**1.6%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**77.8%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**7.0%**

**Above 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
Changed from Yellow in 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Falls
- Chronic Kidney Disorders

Total deaths per 100,000 (2019)
**533.43**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**32.25**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.05
2. Dedicated COVID-19 Health Centres: .....0.125
3. Dedicated COVID-19 Care Centers: .....0.400
4. Dedicated COVID-19 Beds: ..... 159.400
5. COVID-19 Sample collection centres: .....0.275
6. COVID-19 Testing Laboratories: .....0.500
7. No. of Ventilators: .....0.850
8. No. of Blood Banks: .....0.075
9. No. of Physicians, nurses, midwives: .....NA
10. No. of registered pharmacists: .....NA
11. Vaccination sites: .....0.675

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density) – 87.87
2. Number of Internet subscribers per 100 population – NA
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

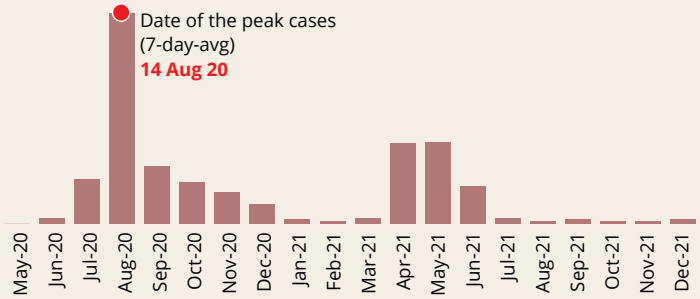
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

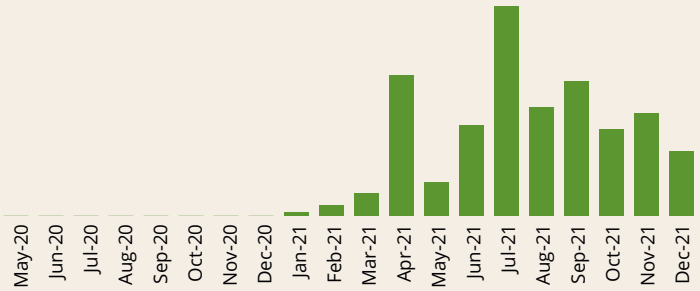
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

- Oxygen generation facility : To augment the medical and support facilities in the Islands amidst the COVID-19 situation, the facility is being set up at the Indian Naval Hospital, INHS Dhanvantari, in Port Blair in July 2021.
- Upgrade of PHC Garacharma into District Hospital, PHCs at Bakultala, Durgapur and Rangachang, CHC Diglipur to Sub-District Hospital and AYUSH Hospital at Junglighat .
- Upgrade of medical infrastructure and equipments at 49 Health and Wellness Centres

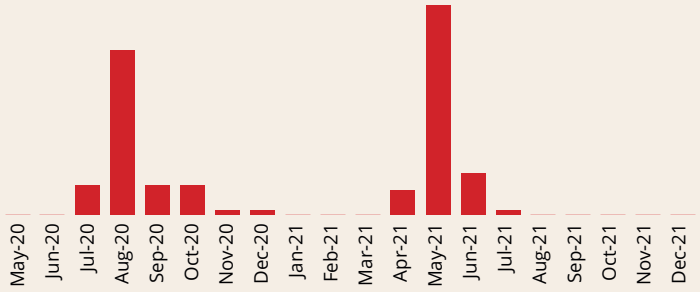
### MONTHLY CASES



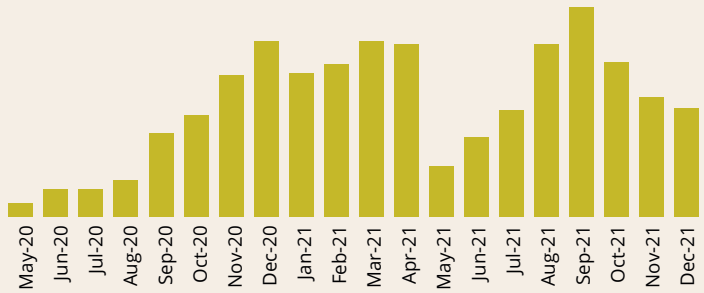

### MONTHLY VACCINATIONS




### MONTHLY DEATHS



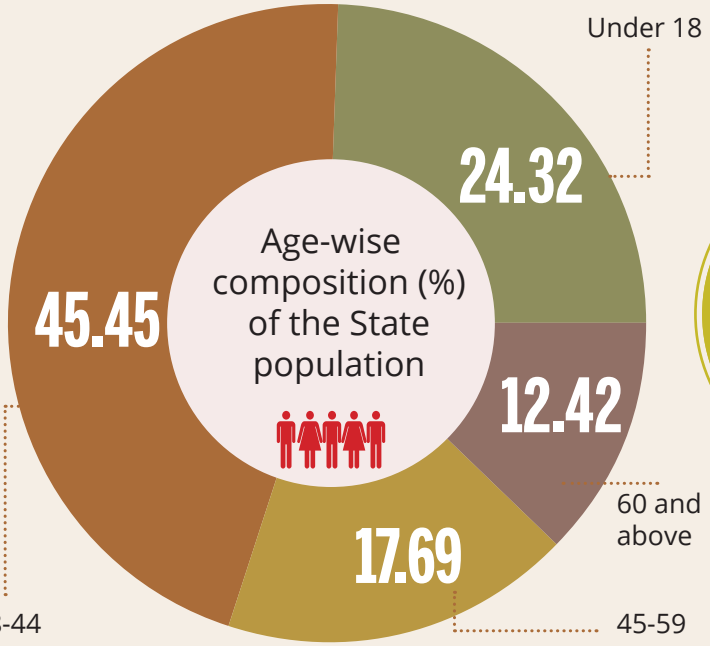

### MONTHLY TESTS




Numbers by month (per 1000 population)

# ANDHRA PRADESH

Total population
**52,789,000**




Population density
**329.5 per km²**

## HEALTH PROFILE

RANK AMONG
28
7
SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**70.2%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**73%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**13.5%**

0.5 - 0.7
Below 0.5
0.5 - 0.7
Above 0.7
BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY
- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Diarrheal diseases
- Diabetes mellitus

Total deaths per 100,000 (2019)
**741.9**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**27.41**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.005
2. Dedicated COVID-19 Health Centres: .....0.027
3. Dedicated COVID-19 Care Centers: .....0.076
4. Dedicated COVID-19 Beds: .....6.633
5. COVID-19 Sample collection centres: .....0.005
6. COVID-19 Testing Laboratories: .....0.048
7. No. of Ventilators: .....1.019
8. No. of Blood Banks:.....0.037
9. No. of Physicians, nurses, midwives: .....95.14
10. No. of registered pharmacists: .....9.811
11. Vaccination sites: .....0.486

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 85.71
2. Number of Internet subscribers per 100 population: 65.61
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | - | - |
| Age-wise Segregation | - | - |

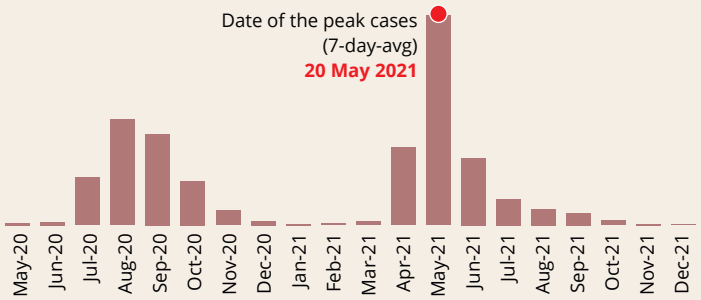
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | No |

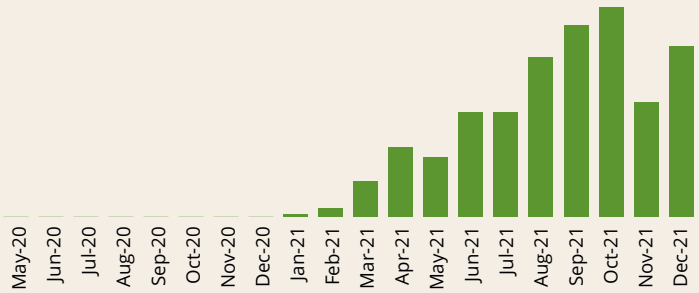
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. Tools developed by the State Disaster Management Authority (SDMA):
   a. Tracking individuals under home quarantine: Maintaining a database of people under home quarantine with their location and mobile number details. SDMA's tool alerts the district authorities if any person in-home quarantine crosses their geo-fences.
   b. Tracking the travel history of individuals by using mobile tower signals to determine what places a person travelled to in the past. These details are then used by authorities to assess the possible spread of the infection in different locations of a region.
2. TruNAT testing machines, previously used for detecting TB, were also used for novel coronavirus to expand the testing capacity.
3. YSR Telemedicine facility launched by the CM for the public, which could be accessed by dialling 14410.
4. COVID-19 Dashboard was developed to keep track of vacant and total hospital beds in the state and other vital numbers.

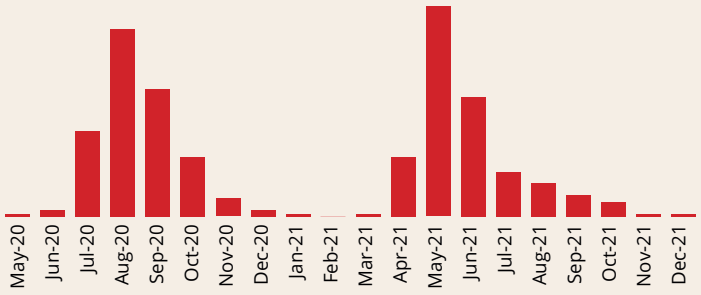
MONTHLY CASES



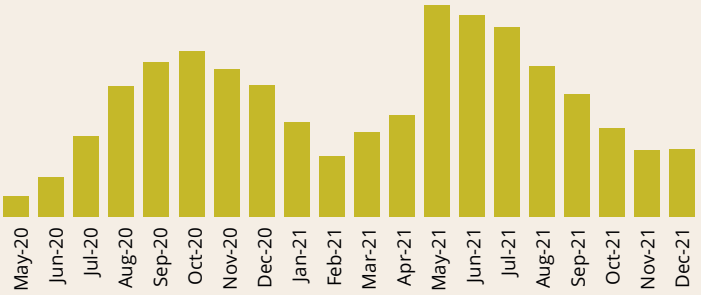

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

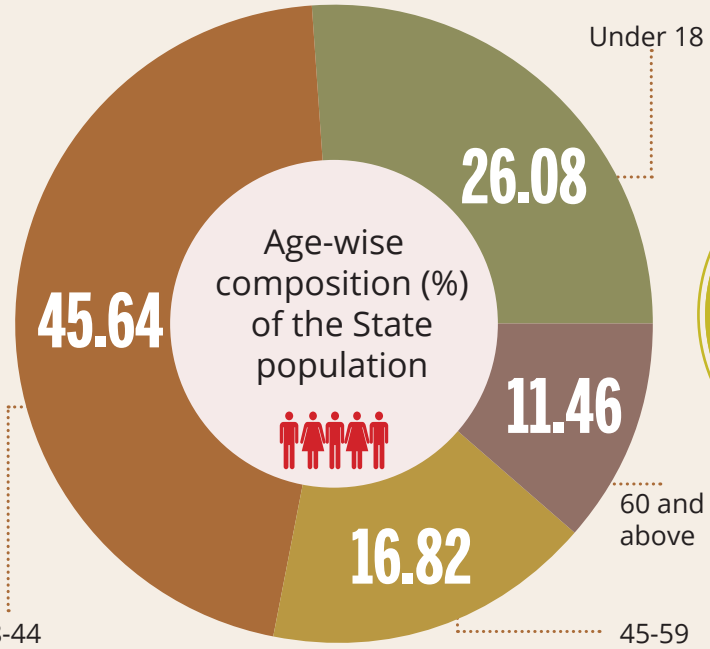
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 2,2461.8 M has been spent on multiple interventions for prevention, mitigation, and management of COVID-19 till May 2021. This includes medicines, testing, PPEs, ventilators, TruNAT chips, oxygen pipelines, vaccines, etc.
- INR 7,540 M was spent on rations in May & June 2021
- INR 5,000 M was allocated for combating COVID-19 and another INR 5,000 M for COVID-19 vaccination
- INR 3,000 M is dedicated to 104 and 108 Helpline services

# KARNATAKA

Total population
**66,843,000**




Population density
**348.5 per km²**

## HEALTH PROFILE

RANK AMONG
28
**6**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**28.1%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**84.1%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.8%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Diarrhoeal disease
- Diabetes mellitus

Total deaths per 100,000 (2019)
**790.4**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**57.26**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 hospitals: .....0.009
2. Dedicated COVID-19 health centres: .....0.131
3. Dedicated COVID-19 care centres: .....0.135
4. Dedicated COVID-19 beds: .....2.055
5. COVID-19 sample collection centres: .....0.505
6. COVID-19 testing laboratories: .....0.143
7. No. of ventilators: .....0.376
8. No. of blood banks: .....0.038
9. No. of physicians, nurses, midwives: .....70.2
10. No. of registered pharmacists: .....9.049
11. Vaccination sites : ..... 0.867

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 100.28
2. Number of Internet subscribers per 100 population: 69.35
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | Yes |
| Age-wise Segregation | No | Yes |

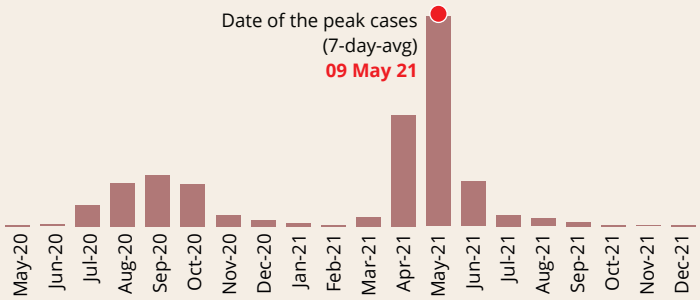
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | No |
| Social Media | Yes |
| If Bulletin available in English | Yes |

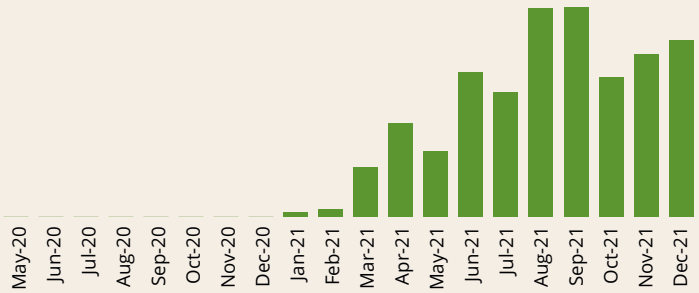
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. Containment Watch, Quarantine Watch and Corona Watch Mobile Applications[viii] : For tracking and surveillance of covid-positive patients using GPS coordinates and locating nearest covid facilities
2. Karnataka Health Watch Mobile Application: To map high-risk households and vulnerable populations and conduct consultations for them from a tele-ICU facility in Bengaluru.
3. Apthamitra Teleconsultation Helpline & Mobile App[ix] : It is a Tele-health initiative that employs both an Interactive Voice Response System (IVRS) and experienced doctors to help treat mild to moderate cases at home while also prescribing necessary over-the-counter medications.
4. COVID-19 Dashboard[x] for citizens' engagement and information dissemination

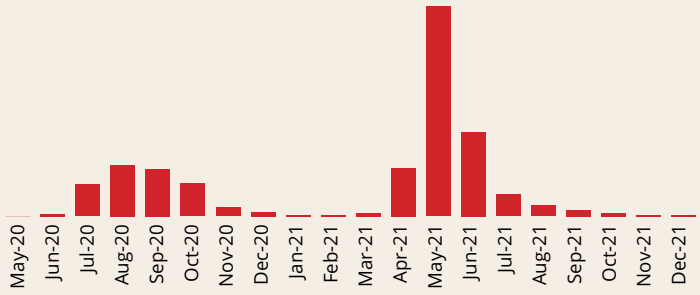
MONTHLY CASES



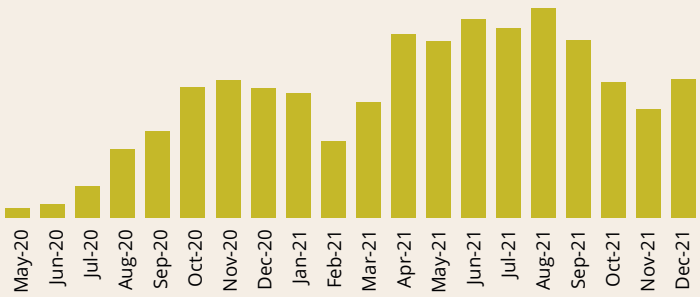

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

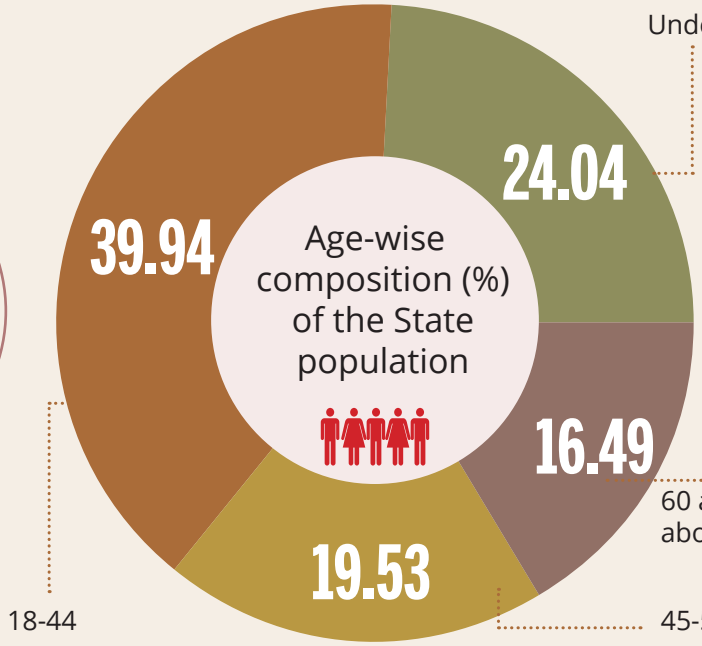
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 53,720 M spent for COVID-19 management; 6.36 M beneficiaries received aid.
- INR 600 M reserved for the next 2 years to develop 25-bed and 6-bed ICUs in 19 district hospitals and 100 taluka hospitals, respectively, to make judicious use of advanced health facilities created during the COVID-19 period.
- INR 20 M is dedicated to strengthening the Tele-ICU facilities created to manage the shortage of medical experts during the pandemic 250 PHCs to be upgraded to model centres with the required equipment and by rationalising available workforce

# KERALA

Total population
**35,490,000**




Population density
**913.21 per km²**

## HEALTH PROFILE

RANK AMONG
28
**14**

SDG 3
(GOOD HEALTH & WELL BEING)
INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**51.5 %**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**77.8%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.8%**

Above 0.7

Below 0.5
0.5 - 0.7
Above 0.7

**BARE NECESSITIES INDEX (BNI)**
Changed from Yellow in 2012

**TOP 5 CAUSES OF MORTALITY**

- Ischemic Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Chronic Kidney disease
- Diabetes mellitus

Total deaths per 100,000 (2019)
**728.84**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**122.92**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.009
2. Dedicated COVID-19 Health Centres: .....0.059
3. Dedicated COVID-19 Care Centers: .....0.025
4. Dedicated COVID-19 Beds: .....25.631
5. COVID-19 Sample collection centres: .....0.101
6. COVID-19 Testing Laboratories: .....0.069
7. No. of Ventilators: .....0.135
8. No. of Blood Banks: .....0.054
9. No. of Physicians, nurses, midwives: .....115
10. No. of registered pharmacists: .....19.287
11. Vaccination sites: .....0.339

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 123.01
2. Number of Internet subscribers per 100 population: 77.47
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | Yes |
| Age-wise Segregation | No | Yes |

| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

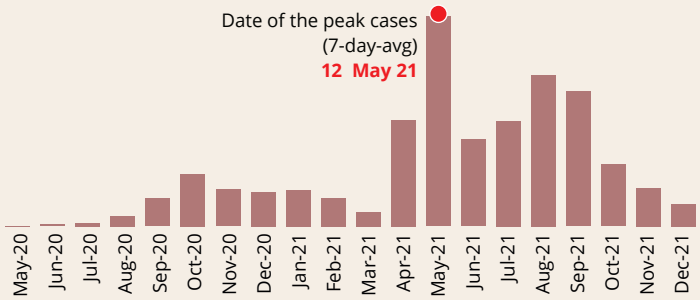
a. Unmaze[xii], a mobile application developed by Innefu Labs, was used by the police authorities in Kasaragod district for contact tracing and quarantine monitoring purposes using the geo-location of the user along with details of nearby devices

b. The Kerala Police developed a cyber Dome and Eagle Eye's project to track the movement of people in quarantine using geofencing technology. The project employed close to 350 drone operators for surveillance and patrolling.

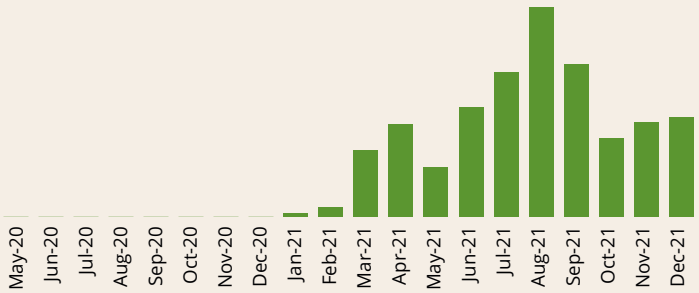
c. Hospitals used Nightingale-19 Robots and KARMI-Bots in Kannur, Thalassery, and Ernakulum districts, respectively, to deliver food, medicines, and other essential items and for doctors to interact with patients from a distance using a camera.

d. COVID-19 Jagratha portal for citizen engagement and Dashboard[xiv] for regular information dissemination.

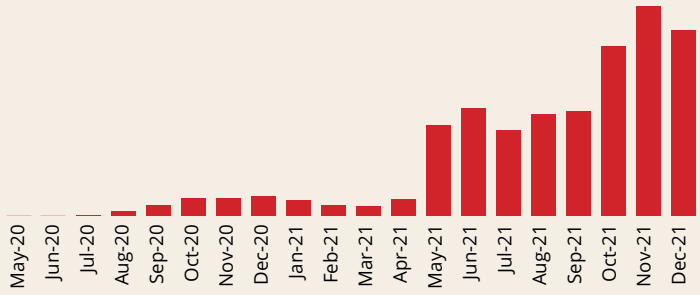
### MONTHLY CASES



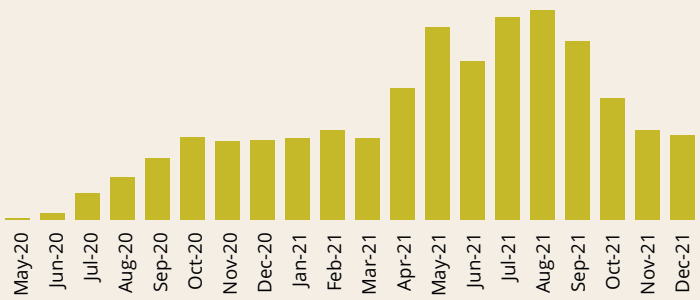

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

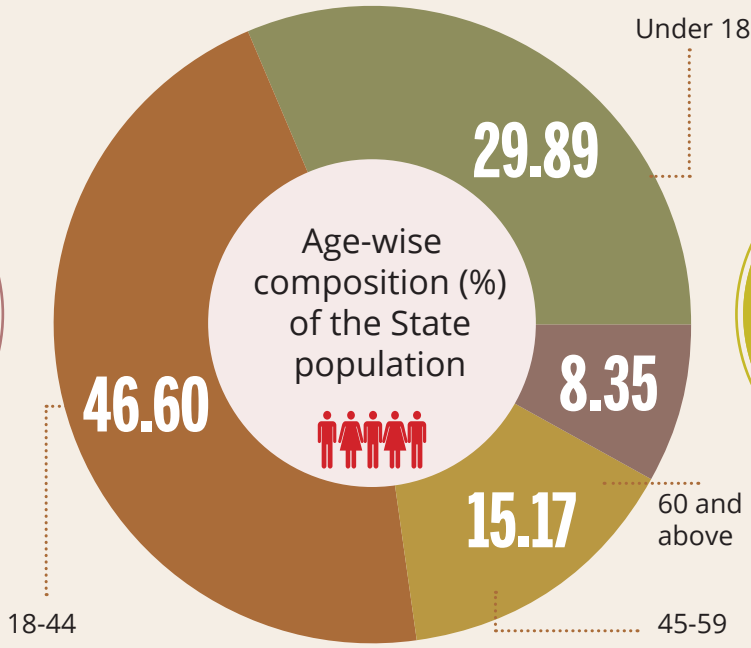
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- The 2021-22 budget announced a second covid package of INR 200,000 M. The Breakdown:
  - Health emergency: INR 28,000 M
  - Directly disbursing money to those in crisis: INR 89,000 M
  - Interest subsidy for loans provided for economic rejuvenation: INR 83,000 M
- Essentials planned expenditure to mitigate future waves of the Coronavirus:
  - INR 6,365 M for setting up ten-bed isolation wards in all CHC, Taluk, District, and General Hospitals from the Asset Development Funds of MLAs.
  - INR 187.5 M for setting up 25 Central Sterile Supply Departments.
  - INR 500 M is allocated to set up isolation blocks in Thiruvananthapuram and Kozhikode Medical Colleges for air-borne diseases like Ebola and Nipah.
  - INR 250 M for enhancing bed strength of paediatric ICUs
  - An initial amount of INR 2.5 M for preparing a liquid medical oxygen plant with 150 MT capacity.
  - INR 10,000 M is earmarked for providing free vaccines to all above the age of 18 years and INR 5,000 M for the purchase of allied equipment
  - INR 100 M is kept aside to create general facilities to attract Vaccine manufacturers for long-term production and research

# LAKSHADWEEP

Total population
**2,125**




Population density
**32 per km²**

## HEALTH PROFILE

RANK AMONG
8
**3**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**60.1%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**86.1%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.6%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Falls
- Chronic Kidney Disorders

Total deaths per 100,000 (2019)
**533.43**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**75.00**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.147
2. Dedicated COVID-19 Health Centres: .....0.735
3. Dedicated COVID-19 Care Centers: .....0.735
4. Dedicated COVID-19 Beds: .....17.059
5. COVID-19 Sample collection centres: .....1.618
6. COVID-19 Testing Laboratories: .....1.029
7. No. of Ventilators: .....7.647
8. No. of Blood Banks: .....0.147
9. No. of Physicians, nurses, midwives: .....NA
10. No. of registered pharmacists: .....NA
11. Vaccination sites: .....1.324

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density) – 124.28
2. Number of Internet subscribers per 100 population – NA
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

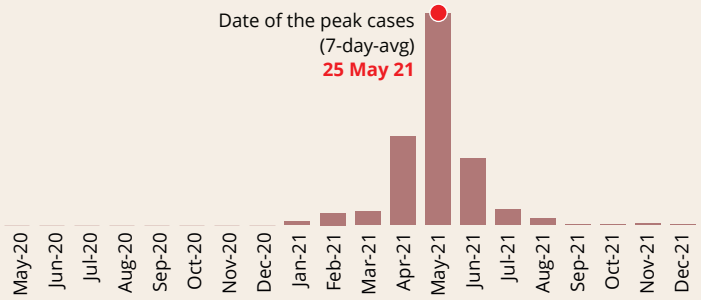
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | No |

| | |
|---|---|
| Beds/Hospital Data (Real time) | No |
| Social Media | No |
| If Bulletin available in English | Yes |

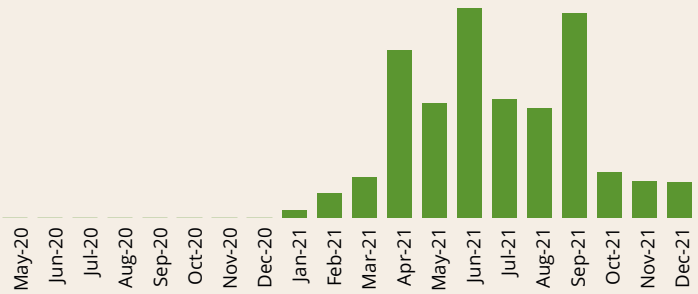
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

- An oxygen generation plant (PSA) was installed at Minicoy in June 2021 with a capacity of 170 LPM as a donation. It can provide oxygen to 50 beds, and it was donated by the Luthra Group of Surat, Gujarat.[xvi]

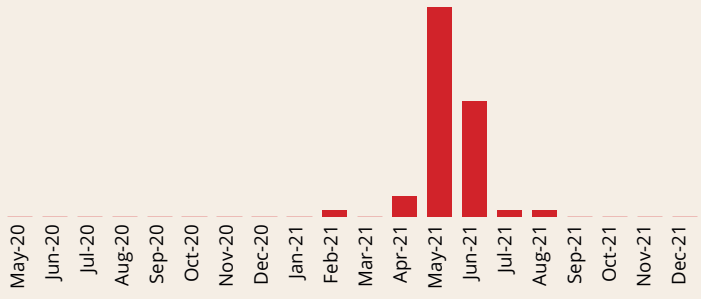
MONTHLY CASES



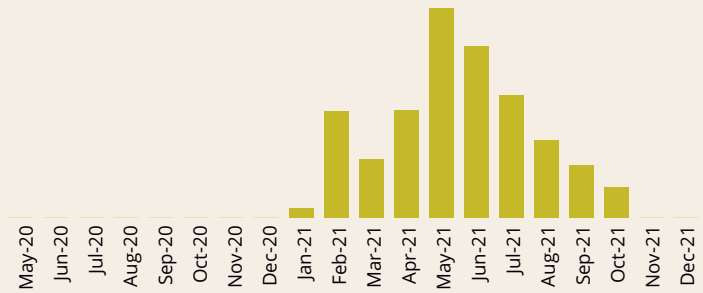

MONTHLY VACCINATIONS




MONTHLY DEATHS



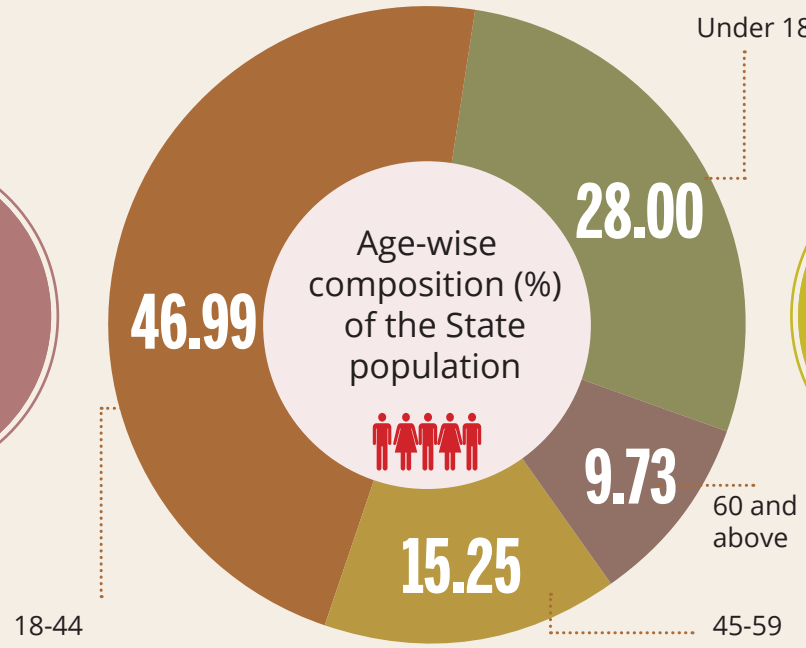

MONTHLY TESTS




Numbers by month (per 1000 population)

# PUDUCHERRY

Total population
**1,572,000**




Population density
**3,195.12 per km²**

## HEALTH PROFILE

RANK AMONG
8
7

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**30.1%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**82%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**7.2%**

N/A

Above 0.7 | 0.5 - 0.7 | Below 0.5

BARE NECESSITIES INDEX (BNI)

### TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Falls
- Chronic Kidney Disorders

Total deaths per 100,000 (2019)
**533.43**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**119.47**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.019
2. Dedicated COVID-19 Health Centres: .....0.051
3. Dedicated COVID-19 Care Centers:.....0.038
4. Dedicated COVID-19 Beds: .....61.298
5. COVID-19 Sample collection centres: .....0.522
6. COVID-19 Testing Laboratories: .....0.242
7. No. of Ventilators:.....0.681
8. No. of Blood Banks: .....0.102
9. No. of Physicians, nurses, midwives: .....NA
10. No. of registered pharmacists: ..... 18.162
11. Vaccination sites: .....0.375

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 100.28
2. Number of Internet subscribers per 100 population: 69.35
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | No |
| Age-wise Segregation | Yes | No |

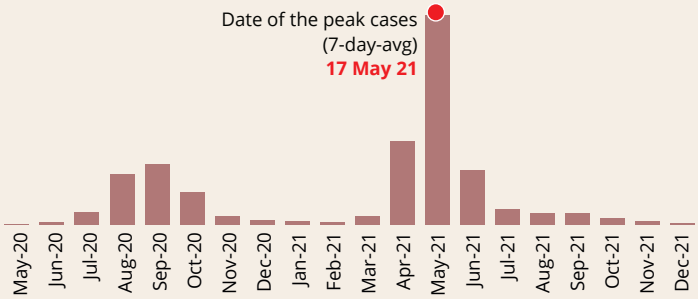
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | No |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | No |
| If Bulletin available in English | Yes |

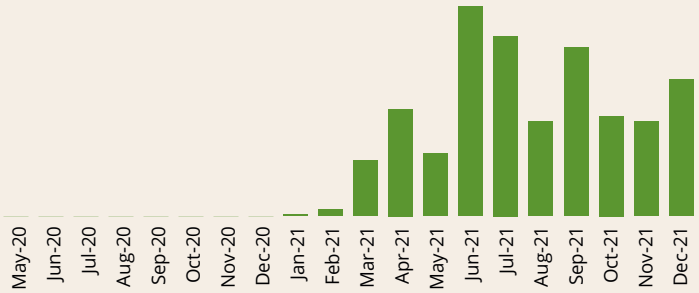
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

- Test Yourself App[xvii] : Application developed by Innovaccer Inc., a healthcare company based in San Francisco, USA. This app helps in carrying out a self-assessment test for COVID-19. This is being used by governments of Karnataka, Puducherry, and Goa.

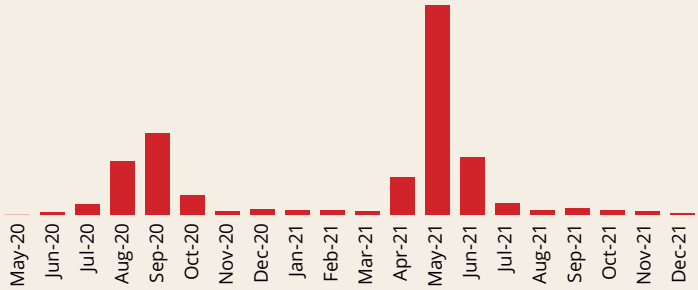
MONTHLY CASES



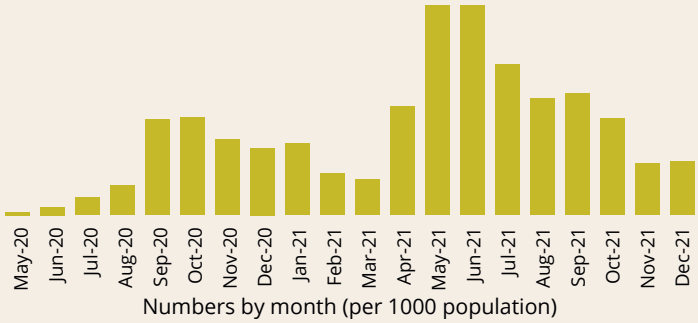

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

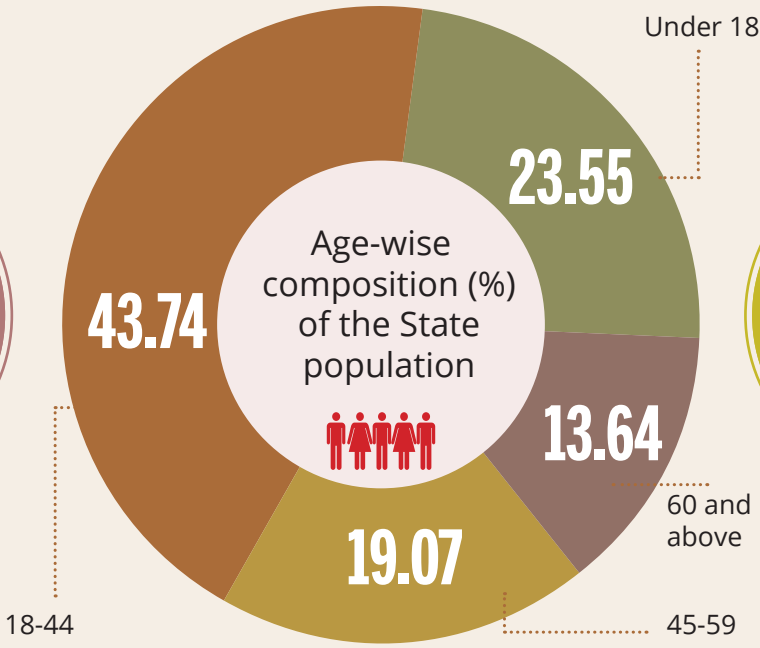
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Universal health coverage for around 3,40,000 families ration card beneficiaries was provided under the Indira Gandhi Health Insurance Scheme. The total expenditure on this was INR 160 M
- INR 250 M was allocated for covid related procurements, out of which a total of 95 M was spent on masks and other equipment.
- INR 100.8 M is dedicated to the maintenance of Wellness Centres.
- INR 10.5 M spent on procurement of high-end medical equipment

# TAMIL NADU

Total population
**76,402,000**




Population density
**587.45 per km²**

## HEALTH PROFILE

**RANK AMONG**
**28**
**3**

**SDG 3**
(GOOD HEALTH & WELL BEING)
**INDEX RANK**

Households with any usual member covered under a health insurance/ financing scheme
**66.5%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**89.2%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.1%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

**BARE NECESSITIES INDEX (BNI)**
unchanged since 2012

**TOP 5 CAUSES OF MORTALITY**

- Ischemic Heart Disease
- Diabetes mellitus
- Stroke
- Chronic obstructive pulmonary disease
- Chronic kidney disease

Total deaths per 100,000 (2019)
**769.13**

**COVID-19 deaths reported per 100,000 population**
(as of 15th Dec 2021)
**47.96**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.007
2. Dedicated COVID-19 Health Centres: .....0.067
3. Dedicated COVID-19 Care Centers: .....0.091
4. Dedicated COVID-19 Beds: .....18.270
5. COVID-19 Sample collection centres: .....0.366
6. COVID-19 Testing Laboratories: .....0.062
7. No. of Ventilators: .....0.241
8. No. of Blood Banks: .....0.041
9. No. of Physicians, nurses, midwives: .....65.47
10. No. of registered pharmacists: .....11.509
11. Vaccination sites: .....0.246

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 101.75
2. Number of Internet subscribers per 100 population: 65.68
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | Yes |
| Age-wise Segregation | Yes | Yes |

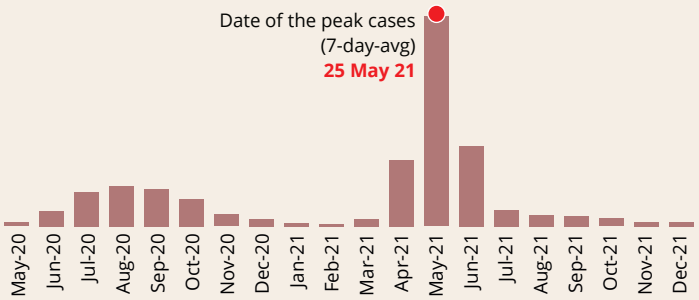
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

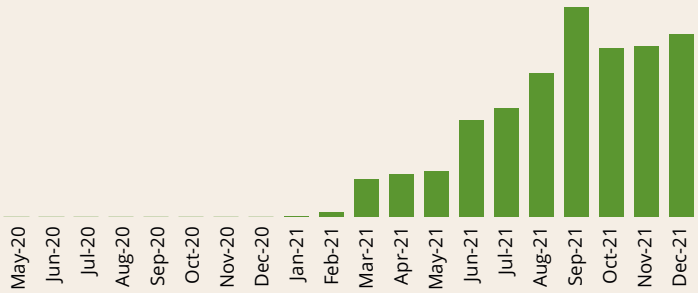
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Quarantine Monitor**[xix] **:** App developed by the Tamil Nadu State Government's e-Governance Agency to track the movement of COVID-19 suspects under home quarantine. It alerts the monitoring authorities if the suspect moves beyond the designated fences and tracks symptoms of people quarantined at home.
2. Tamil Nadu e-Governance Agency created an Interactive Voice Response System (IVRS)[xx] version of the Aarogya Setu application to analyze an individual's health condition based on their response to the IVRS. Available in Tamil, it can function without an internet connection.
3. Tanjore Air Barrier Technique in Madurai: Meenakshi Mission Hospital and Research Centre in Madurai used this technique for delivering compressed medical-grade air to health personnel in operation theatres through a hood and Bluetooth stethoscope. The technology leverages AI and Robotics for detecting symptoms in visitors (through smart infrared AI helmets for checking temperature, innovative fever clinics, and smart thermal surveillance cameras), sterilizing facilities as well as treating patients without the need for contact."
4. **CoBuddy**[xxi]**:** It is an android-based geofencing mobile app used by Police authorities in the Tiruvallur district. It works by using face verification as an additional layer of protection. For this, random messages are sent to the quarantined user to upload their photograph and verify their current location throughout the day.

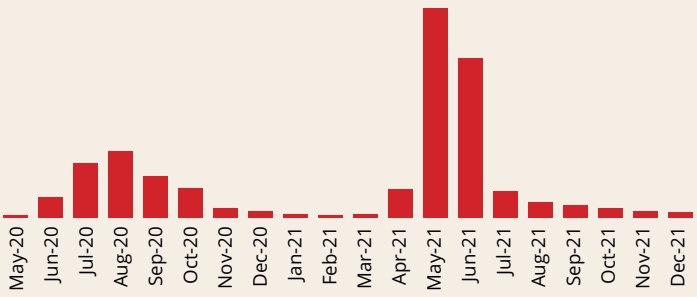
MONTHLY CASES



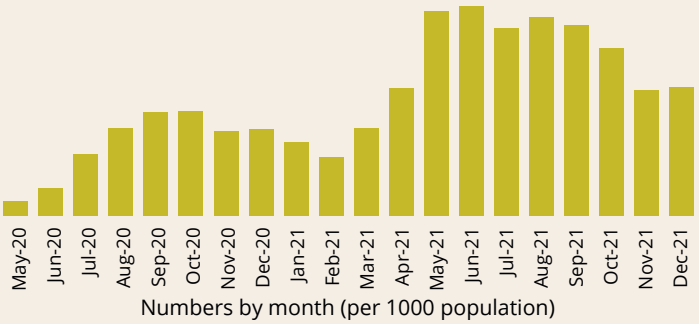

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

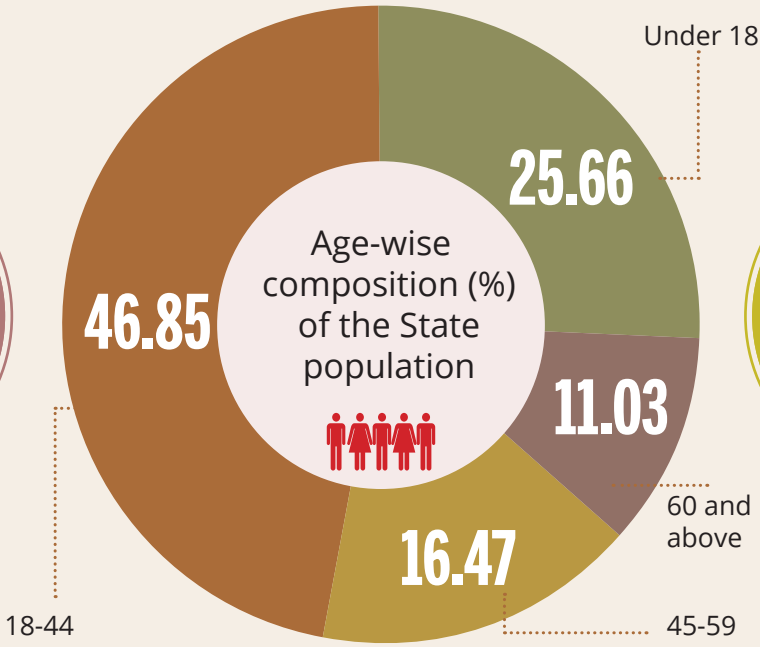
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Overall expenditure was INR 13,3528.5 M on the pandemic response in 2020. Additionally, INR 119,438.5 M was spent from the SDR Fund.
- A Covid Assistance Package worth INR 3,000 M was delivered by leveraging the Tamil Nadu Rural Transformation Project with assistance from the World Bank.
- The yearly Pongal Gift Hamper was distributed along with cash assistance of INR 2500 per family in 2021, with the total cost being INR 5,6048.4 M. This was provided for people who suffered from successive cyclones and unseasonal heavy rains on top of the impact of the pandemic.[xxiii]
- In May 2021, CM MK Stalin ordered the deployment of INR 500 M from the relief fund for procuring drugs for COVID-19 treatment and getting containers for transporting liquid oxygen through trains to TN from states like Odisha.[xxiv]

# TELANGANA

Total population
**37,725,000**




Population density
**336.60 per km²**

## HEALTH PROFILE

**RANK AMONG**
**28**
**19**

**SDG 3**
(GOOD HEALTH & WELL BEING)
**INDEX RANK**

Households with any usual member covered under a health insurance/ financing scheme
**60.8%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**79.1%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**14.4%**

**0.5 - 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

**BARE NECESSITIES INDEX (BNI)**
unchanged since 2012

**TOP 5 CAUSES OF MORTALITY**

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Stroke
- Diarrheal diseases
- Neonatal disorders

Total deaths per 100,000 (2019)
**584.52**

**COVID-19 deaths reported per 100,000 population**
(as of 15th Dec 2021)
**10.63**

# MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.011
2. Dedicated COVID-19 Health Centres: .....0.002
3. Dedicated COVID-19 Care Centers:..... 0.001
4. Dedicated COVID-19 Beds: .....14.696
5. COVID-19 Sample collection centres: .....0.019
6. COVID-19 Testing Laboratories: .....0.075
7. No. of Ventilators:..... 0.371
8. No. of Blood Banks: .....0.060
9. No. of Physicians, nurses, midwives: .....10.34
10. No. of registered pharmacists: .....17.198
11. Vaccination sites: .....0.806

# TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 109.9
2. Number of Internet subscribers per 100 population: 65.61
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | Yes | No |
| Age-wise Segregation | Yes | No |

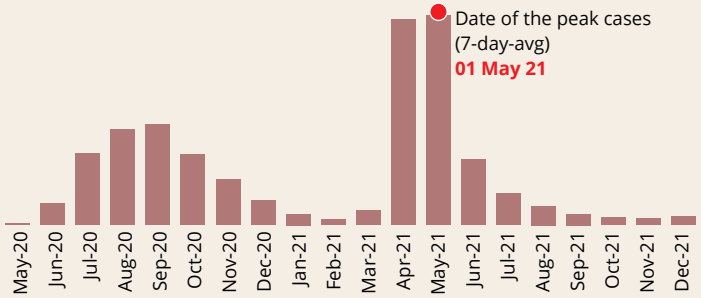
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

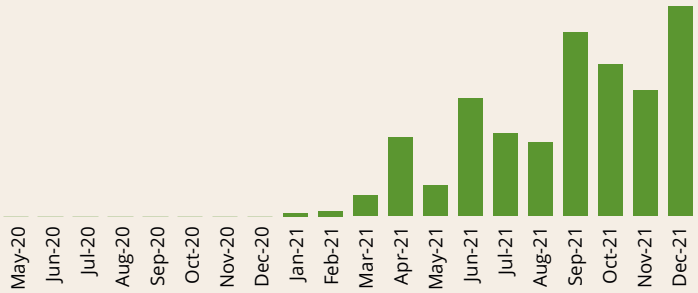
# GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **T-COVID'19/HIMAT Application[xxv]:** Built jointly by Cisco, AWS, and Quantella and promoted by the Departments of health and information technology, it provides monitoring and telemedicine services to patients. It also enables patients to carry out a self-assessment and helps them connect with doctors to clear doubts and misconceptions.
2. **COVIHOME[xxvi]:** Researchers at IIT-Hyderabad developed an AI-powered affordable COVID-19 test that can be performed at home. The kit can produce results within 30 mins for both symptomatic and asymptomatic patients, and it does not require an expert or an RT-PCR. A report by CSIR-Centre for Cellular & Molecular Biology (CCMB) confirmed the kit's efficiency was 94.2%, sensitivity 91.3%, and specificity 98.2%.
3. Collaboration with Hyderabad-based start-up Vera Healthcare[xxvii] for monitoring the containment zones by using a traveller tracking system to record travel history, symptoms, and contacts of passengers on the railway. The app enables live surveillance, monitoring, tracking, reporting, and essential bulletins related to this deadly disease. It uses geotagging and GPS tracking technology to track people who are quarantined at home.
4. **Smart ventilator:** Developed by Leven Medical, a start-up under the state government's initiative – Hyderabad Security Cluster. It uses AI and ML[xxviii] to allow doctors to remotely manage a patient's health by collecting vitals and data. It also helps to trace contacts of a patient to create a repository for governments and epidemiologists.
5. **'Medicines from the Sky' Project[xxix]:** Pilot project for delivery of medical supplies to remote areas by Flipkart and the government of Telangana. The idea is to develop and execute drone deliveries of medical supplies to remote locations for now and the future.

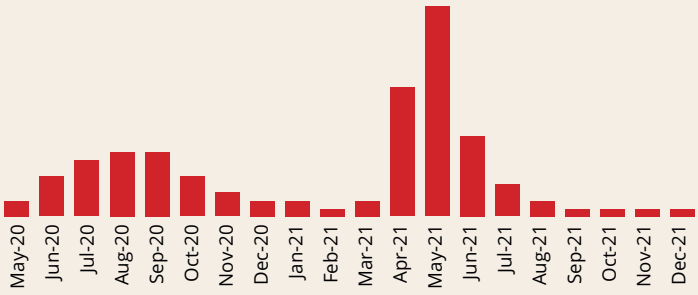
MONTHLY CASES



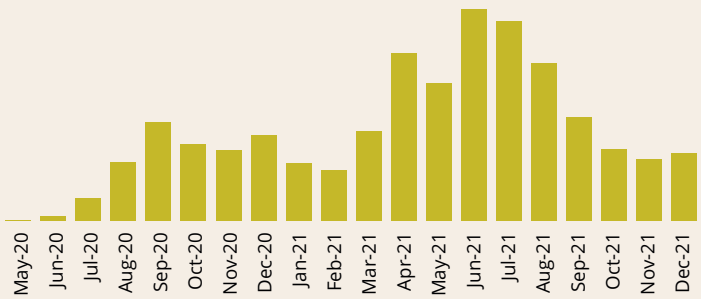

MONTHLY VACCINATIONS




MONTHLY DEATHS




MONTHLY TESTS




Numbers by month (per 1000 population)

# GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

## HIGHLIGHTS

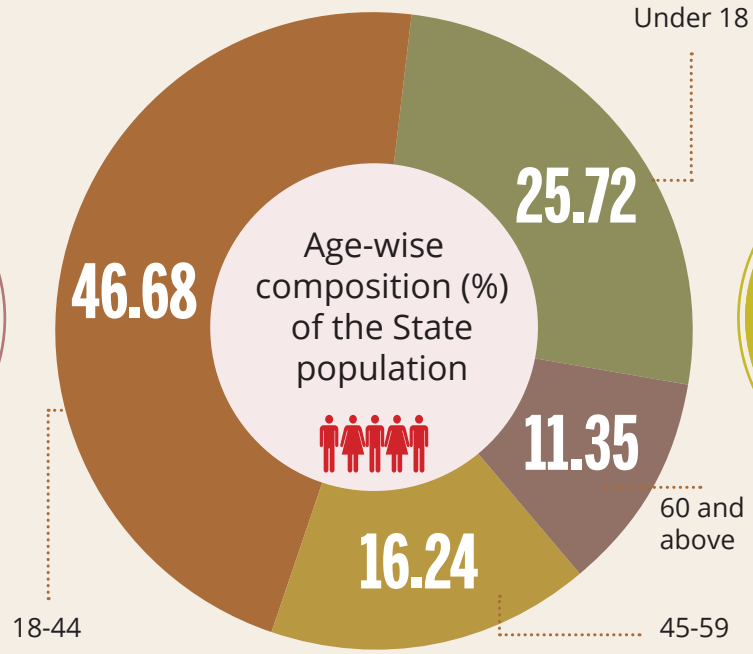
- INR 1,500 was given to each family with a ration card for two months, which cost the government INR 2,4550 M
- INR 500 and 5kg of rice were given to each of the 0.64 M migrant workers, which cost around INR 1,070 M
- The government gave incentives of INR 2,353.6 M to the police, doctors, and sanitation workers fighting covid from the frontlines.
- In July 2021, the state government pledged to spend INR 3,170 M to prepare for future waves of COVID-19 on the following: INR 2,562.7 M to develop paediatric facilities, INR 78.8 M for life-saving medicines, INR 36.4 M for consumables, INR 1,030 M to set up 135 oxygen generation plants and INR 535.8 M to equip 133 govt hospitals with oxygen lines.

# WEST INDIA

Goa, Daman & Diu and Dadra & Nagar Haveli,
Gujarat, Maharashtra

# GOA

Total population
**1,559,000**




Population density
**421.12 per km²**

## HEALTH PROFILE

**RANK AMONG**
**28**
**12**

**SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK**

Households with any usual member covered under a health insurance/ financing scheme
**62.5%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**80.8%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.0%**

**Above 0.7**

Below 0.5
0.5 - 0.7
Above 0.7

**BARE NECESSITIES INDEX (BNI)**
unchanged since 2012

**TOP 5 CAUSES OF MORTALITY**

- Ischemic Heart Disease
- Stroke
- Diabetes Mellitus
- Cirrhosis and other chronic liver diseases
- Chronic obstructive pulmonary disease

Total deaths per 100,000 (2019)
**688.04**

**COVID-19 deaths reported per 100,000 population**
(as of 15th Dec 2021)
**217.32**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.019
2. Dedicated COVID-19 Health Centres: .....0.167
3. Dedicated COVID-19 Care Centres:.....0.103
4. Dedicated COVID-19 Beds: .....13.194
5. COVID-19 Sample collection centres: .....0.436
6. COVID-19 Testing Laboratories: .....0.122
7. No. of Ventilators: .....1.283
8. No. of Blood Banks: 0.032
9. No. of Physicians, nurses, midwives: .....33
10. No. of registered pharmacists: .....24.041
11. Vaccination sites: .....0.359

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 177.45
2. Number of Internet subscribers per 100 population: 74.72
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

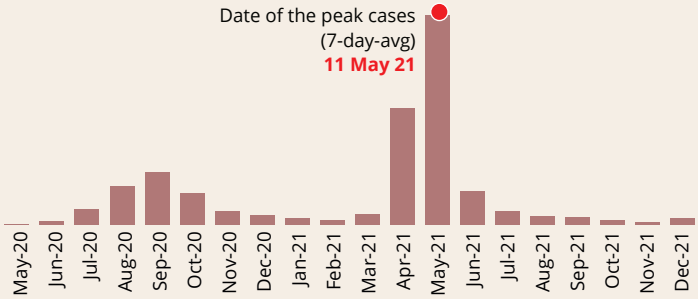
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

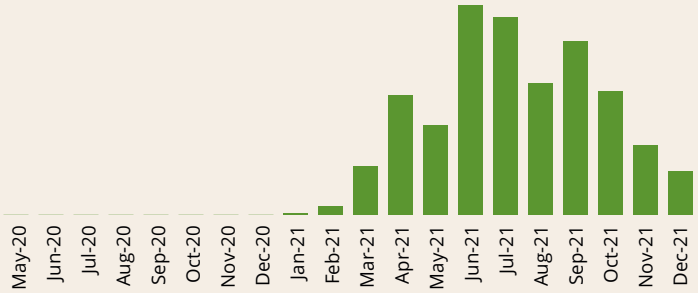
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **Test Yourself Goa**[1] : Launched by Innovaccer, a US-based healthcare company, and the Directorate of Health Services, Govt. of Goa; It allows citizens to self-evaluate to identify the risk of COVID-19. This app provides info on real-time COVID-19 protocols, availability of health facilities and helps to take up a survey on COVID-19 symptoms.

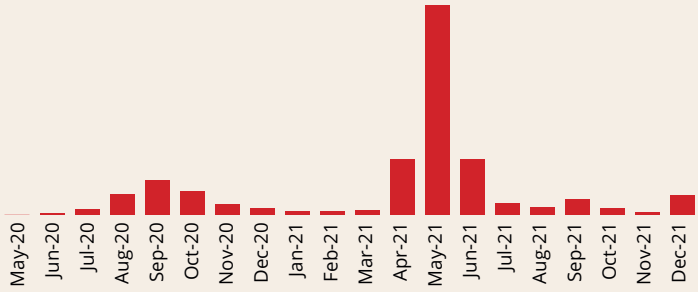
### MONTHLY CASES



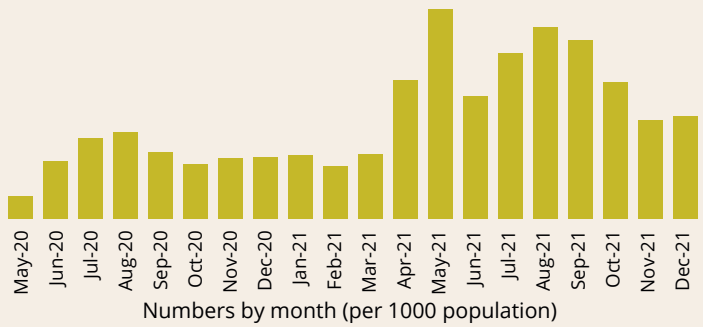

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS

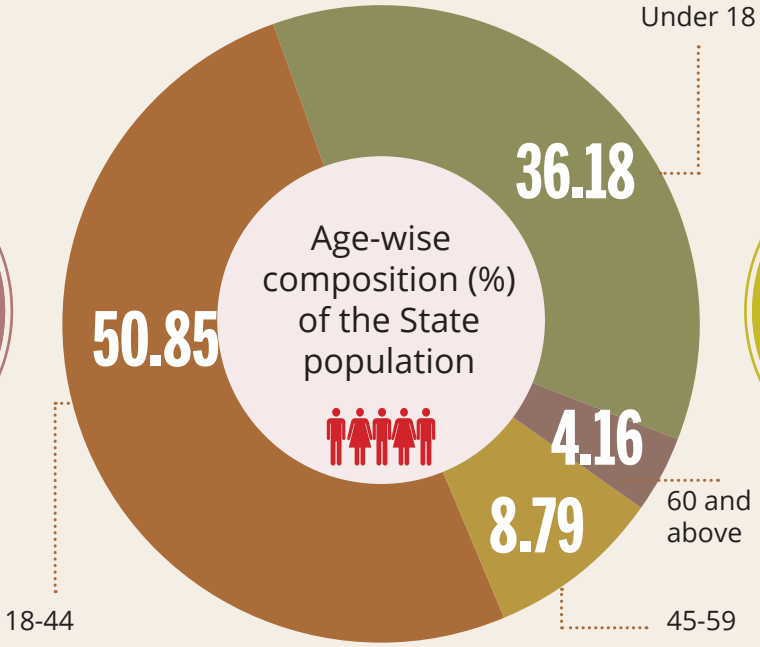



## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- Proposed the issuance of Health cards to the migrant workforce in the State to manage their well-being and health
- Proposed the setting up of an AIIMS and a medical college in South Goa district.
- Launched the "Health for All" Initiative for overall, comprehensive health check-ups and well-being of its citizens, starting September 2021

Total population
**1,078,000**




Population density
**1787.73 per km²**

## HEALTH PROFILE

RANK AMONG
8
**2**

SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**52%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**94.9%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**5.5%**

**N/A**

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Stroke
- Chronic obstructive pulmonary disease
- Falls
- Chronic Kidney Disorders

Total deaths per 100,000 (2019)
**NA**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**0.37**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated Covid Hospitals: .....0.028
2. Dedicated Covid Health Centres:.....0.028
3. Dedicated Covid Care Centres:.....0.056
4. Dedicated COVID-19 Beds: .....13.033
5. COVID-19 Sample collection centres: .....0.241
6. COVID-19 Testing Laboratories: ..... 0.148
7. No.of Ventilators: .....0.186
8. No.of Blood Banks: .....0.028
9. No. of Physicians, nurses, midwives: .....NA
10. No. of registered pharmacists: ..... 4.351
11. Vaccination sites: .....0.473

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 70.02
2. Number of Internet subscribers per 100 population: NA
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

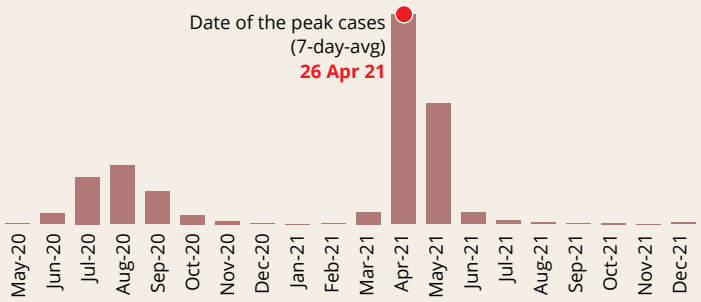
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | No | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | No |
| If Bulletin available in English | Yes |

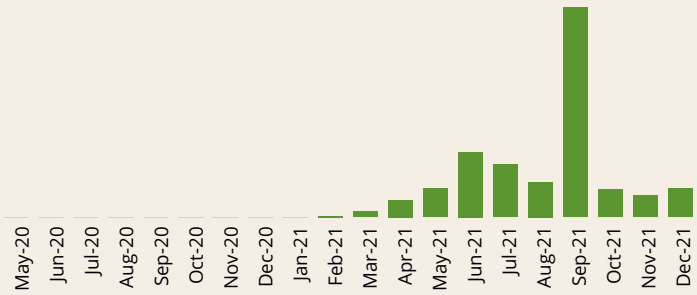
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. The administration conducted door-to-door survey and COVID-19 screenings to map vulnerable population and monitor the spread of infection. The UTs also manufactured their own PPE kits and N-95 masks.
2. Food Helplines were employed to provide meals to the needy, using which, about 6,000 meals have been distributed apart from dry rations kits.

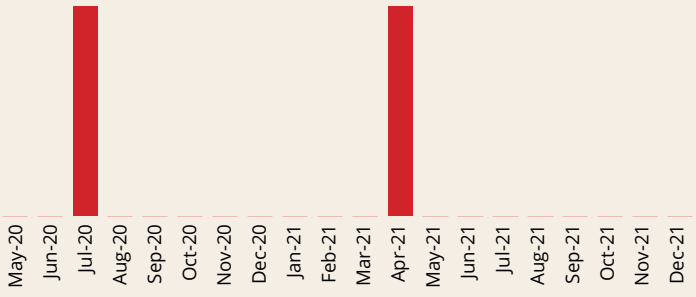
### MONTHLY CASES




### MONTHLY VACCINATIONS

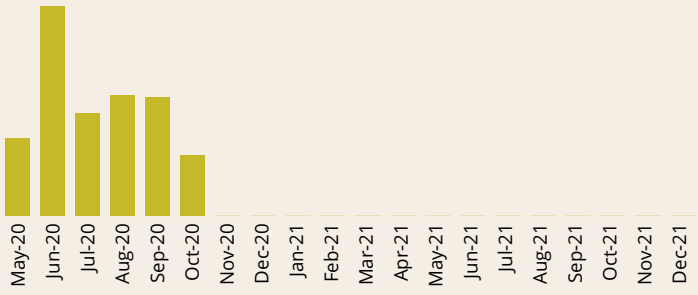



### MONTHLY DEATHS




Numbers by month (per 1000 population)

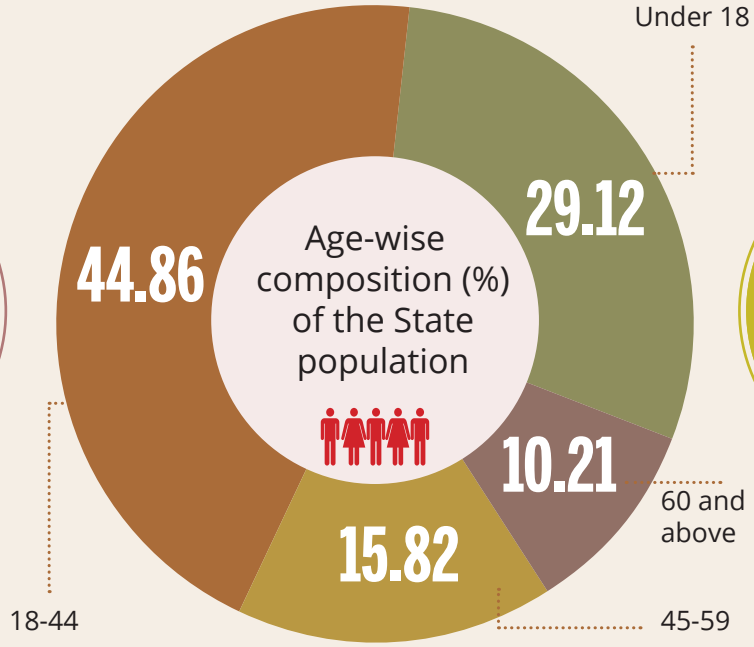
### MONTHLY TESTS




Data for November 2020 to December 2021 are not available.

# GUJARAT

Total population
**69,788,000**




Population density
**356.02 per km²**

## HEALTH PROFILE

RANK AMONG
28
1

SDG 3
(GOOD HEALTH & WELL BEING)
INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**39%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**76.3%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.5%**

Above 0.7

Below 0.5
0.5 - 0.7
Above 0.7

BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY

- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Tuberculosis
- Stroke
- Neonatal Disorders

Total deaths per 100,000 (2019)
**670.59**

COVID-19 deaths reported per 100,000 population
(as of 15th Dec 2021)
**14.47**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.042
2. Dedicated COVID-19 Health Centres: .....0.014
3. Dedicated COVID-19 Care Centres:.....0.046
4. Dedicated COVID-19 Beds: .....7.957
5. COVID-19 Sample collection centres: .....0.398
6. COVID-19 Testing Laboratories: .....0.083
7. No.of Ventilators: .....0.781
8. No.of Blood Banks: .....0.025
9. No. of Physicians, nurses, midwives: .....41.19
10. No. of registered pharmacists: .....9.959
11. Vaccination sites: .....0.492

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 94.71
2. Number of Internet subscribers per 100 population: 64.79
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

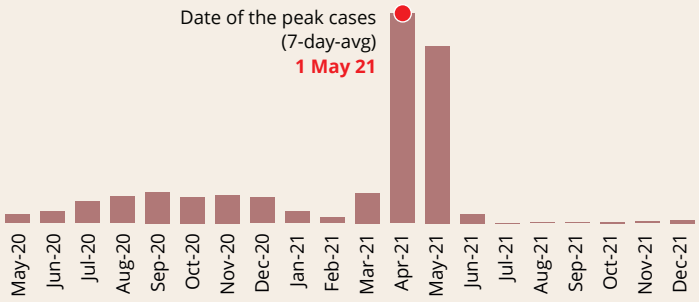
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | No |

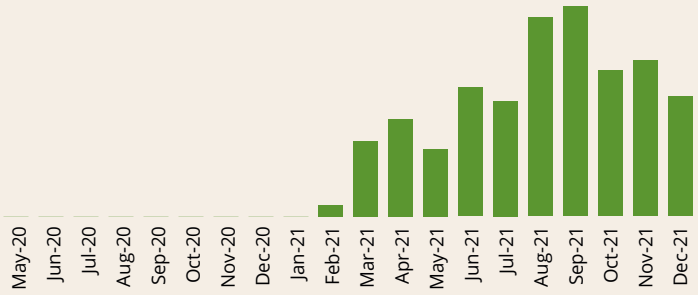
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. **SMC COVID-19 Tracker:** Gujarat Government sanctioned GIS-based mobile app to track the movement of COVID-19 positive patients and suspects under home quarantine using GPS coordinates. It is also equipped with Geo Fencing which will alert authorities if moved beyond the quarantine area[4].
2. **LiFi Technology:** Launched by Nav Wireless Technology Pvt. Ltd. to monitor COVID-19 Patients. It uses LED light as a medium to transfer and receive critical information like ventilator reading, temperature, etc. It was pilot tested in a hospital in Ahmedabad[5].

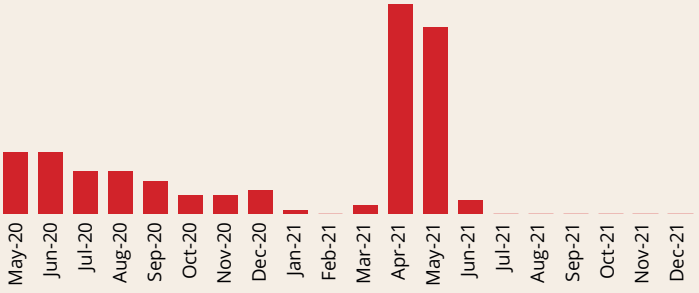
### MONTHLY CASES



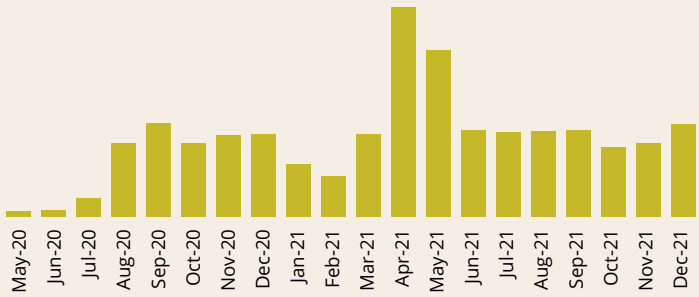

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

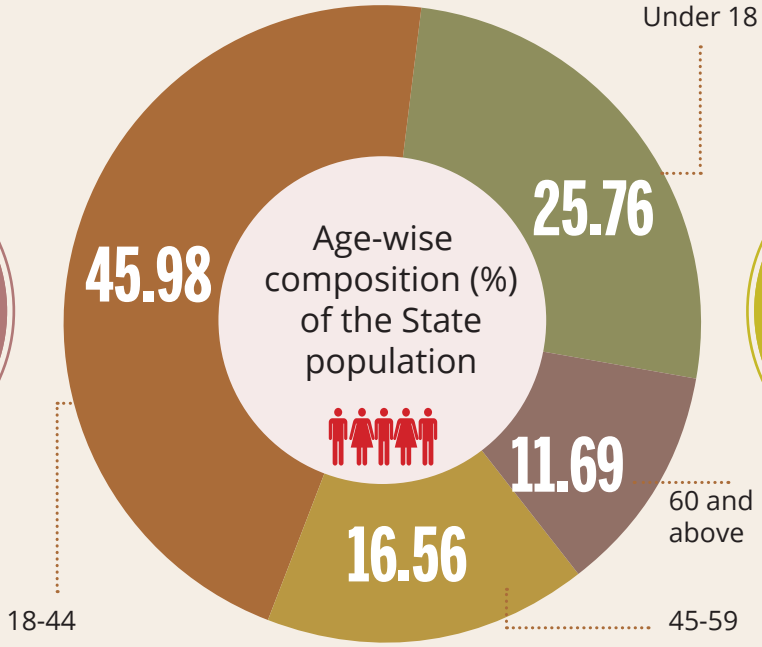
## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

### HIGHLIGHTS

- INR 12,890 M was utilised between April-October 2020 to manage the novel coronavirus in the state
- INR 50 M was allocated to constructing new Medical Colleges in Godhra and Morbi and to upgrade existing Hospitals. INR 870 M dedicated to expansion at the Civil Hospital, Ahmedabad.
- Sanctioned the establishment of a Special Vaccination Cell to facilitate the vaccination process in the state. INR 30 M is dedicated to setting up Vaccine Stores across 9 districts.

# MAHARASHTRA

Total population
**124,437,000**




Population density
**404.39 per km²**

## HEALTH PROFILE

RANK AMONG
28
**2**
SDG 3 (GOOD HEALTH & WELL BEING) INDEX RANK

Households with any usual member covered under a health insurance/ financing scheme
**20%**

Children age 12-23 months fully vaccinated based on vaccination card or mother's recall
**73.5%**

Monthly per capita out-of-pocket expenditure on health as a share of per capita consumption expenditure
**9.5%**

**0.5 - 0.7**
Below 0.5
0.5 - 0.7
Above 0.7
BARE NECESSITIES INDEX (BNI)
unchanged since 2012

TOP 5 CAUSES OF MORTALITY
- Ischemic Heart Disease
- Chronic obstructive pulmonary disease
- Tuberculosis
- Stroke
- Neonatal Disorders

Total deaths per 100,000 (2019)
**670.59**

COVID-19 deaths reported per 100,000 population (as of 15th Dec 2021)
**113.55**

## MEDICAL INFRASTRUCTURE

(per 10,000 population)

1. Dedicated COVID-19 Hospitals: .....0.043
2. Dedicated COVID-19 Health Centres: .....0.068
3. Dedicated COVID-19 Care Centres:.....0.156
4. Dedicated COVID-19 Beds: .....46.766
5. COVID-19 Sample collection centres: .....0.181
6. COVID-19 Testing Laboratories: .....0.052
7. No.of Ventilators: .....0.439
8. No.of Blood Banks: .....0.028
9. No. of Physicians, nurses, midwives: .....43.08
10. No. of registered pharmacists: .....20.092
11. Vaccination sites : .....0.714

## TECHNOLOGICAL RESPONSE

1. Number of Mobile connections per 100 population (mobile tele density): 94.71
2. Number of Internet subscribers per 100 population: 64.79
3. COVID-19 Data Reporting:

| | Cases | Deaths |
|---|---|---|
| Gender-wise Segregation | No | No |
| Age-wise Segregation | No | No |

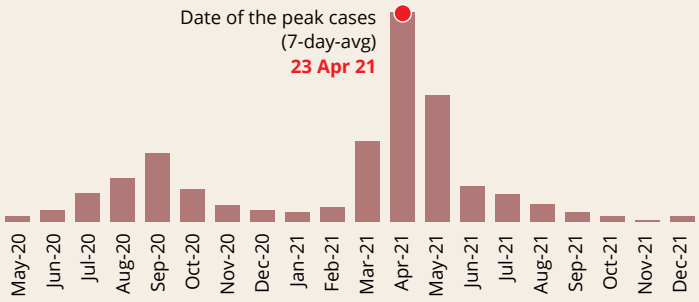
| | Real time | Historical |
|---|---|---|
| Dedicated COVID-19 Website | Yes | Yes |

| | |
|---|---|
| Beds/Hospital Data (Real time) | Yes |
| Social Media | Yes |
| If Bulletin available in English | Yes |

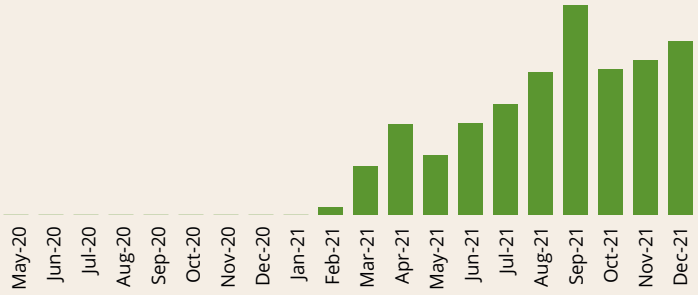
## GOVERNMENT AND NON-PROFIT ORGANISATION INITIATIVES

1. MahaKavach App: Developed by Maharashtra State Innovation Society and the National Health Authority. It tracks suspected COVID-19 cases or those who are quarantined in facilities across Maharashtra. It is essentially a geofencing app[7].
2. AI to detect COVID-19: Defence Institute of Advanced Technology (DIAT), Pune has developed a COVID-19 infection detection tool using Artificial Intelligence which uses the chest X-Rays of the patients[8].
3. Covicare and Coviguard Apps: Developed by the Directorate of Industries, these apps are used in the Municipal corporations of Navi Mumbai and Pune. By providing access to the area-wise information on COVID-19. The Covicare app helps conduct household surveys while Coviguard app monitors the quarantined people and enables personalized chat with the authorities[9].

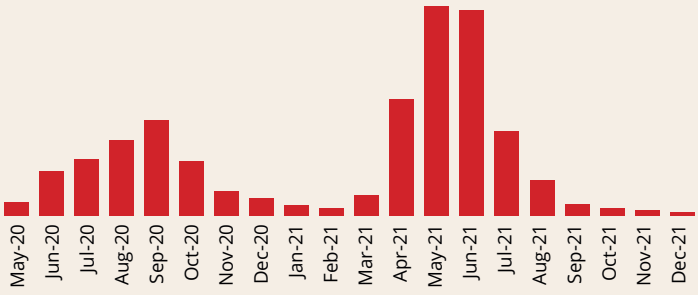
### MONTHLY CASES



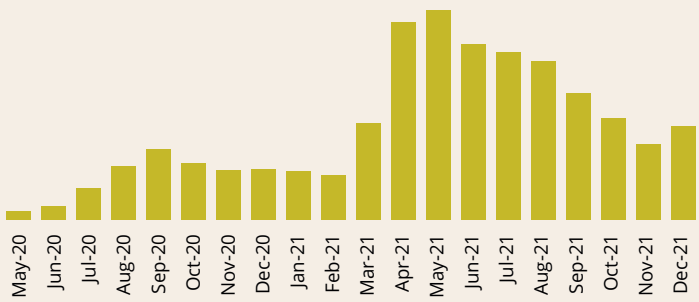

### MONTHLY VACCINATIONS




### MONTHLY DEATHS




### MONTHLY TESTS




Numbers by month (per 1000 population)

## GOVERNMENT INVESTMENTS IN HEALTH (2021-22 BE)

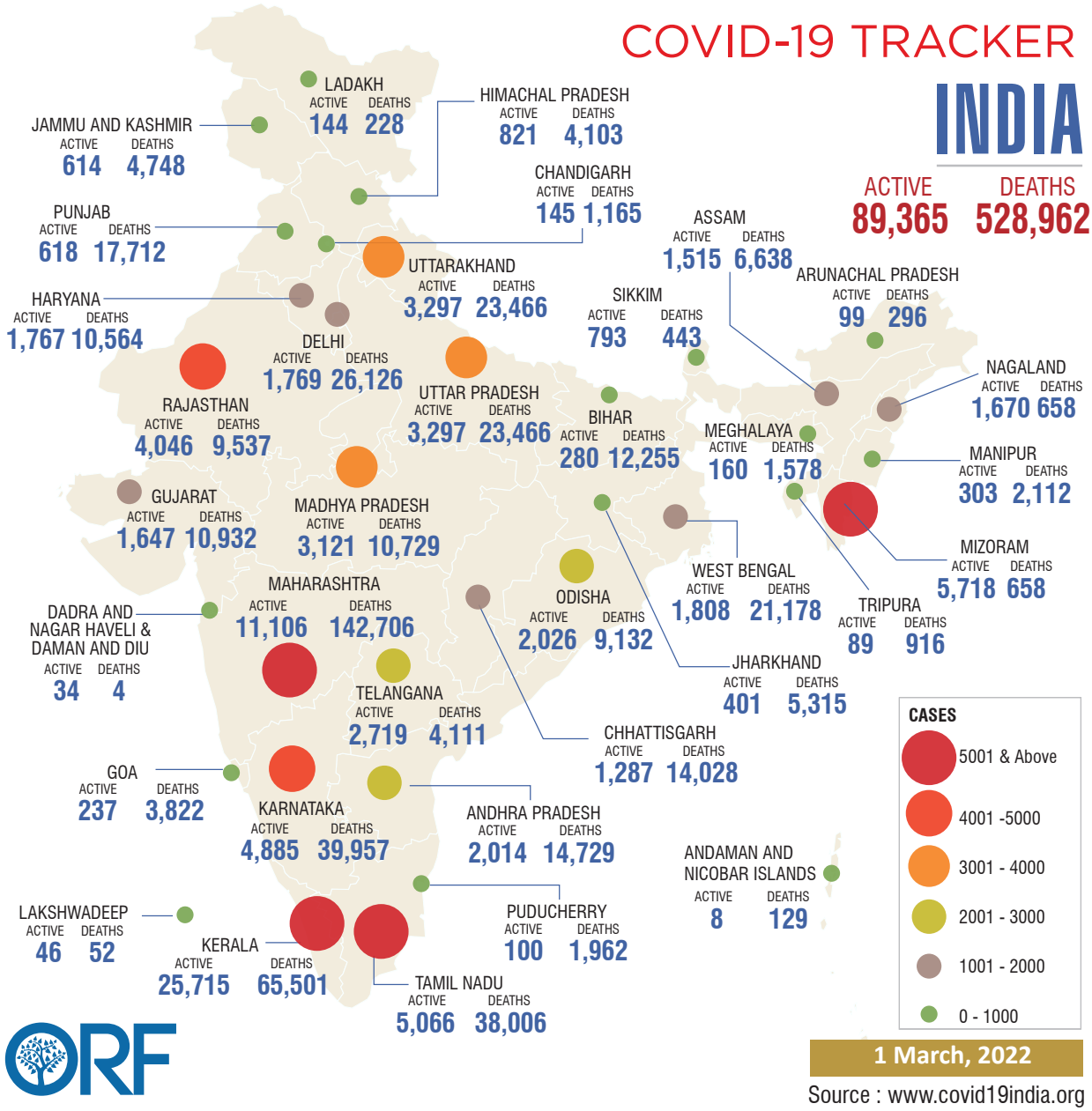
### HIGHLIGHTS

- INR 75,000 M will be spent over four years to upgrade health institutions under the Public Health Department.
- INR 8,000 M out of the designated INR 50,000 M will be released in 2021-22 to improve health services and infrastructure in municipal councils and Nagar Panchayats.
- In a public-private-partnership mode, new medical colleges have been authorised in Sindhudurg, Osmanabad, Nashik, Raigad, Satara, Amravati and Parbhani districts.
- "Post Covid Counselling and Treatment Centres" will be started in every district hospital and government medical college to assist in long COVID-19 and post COVID-19 symptoms, including psychological.

# Overview

India accounts for one of every 10 of the cumulative confirmed COVID-19 infections across the world; more than one-third of Asia's.[1] The recorded deaths are nearly 9 percent of the world's total. It has the second highest number of infections in the world, with the states of Maharashtra, Kerala, and Karnataka reporting the most.[2] At the time of writing, scientists have identified five new "variants of concern"—i.e., alpha, beta, gamma, delta, and omicron—or mutations of the earliest SARS-CoV-2 that have higher transmissibility or virulence, and are challenging the effectiveness of public health and social measures currently in place.[3]

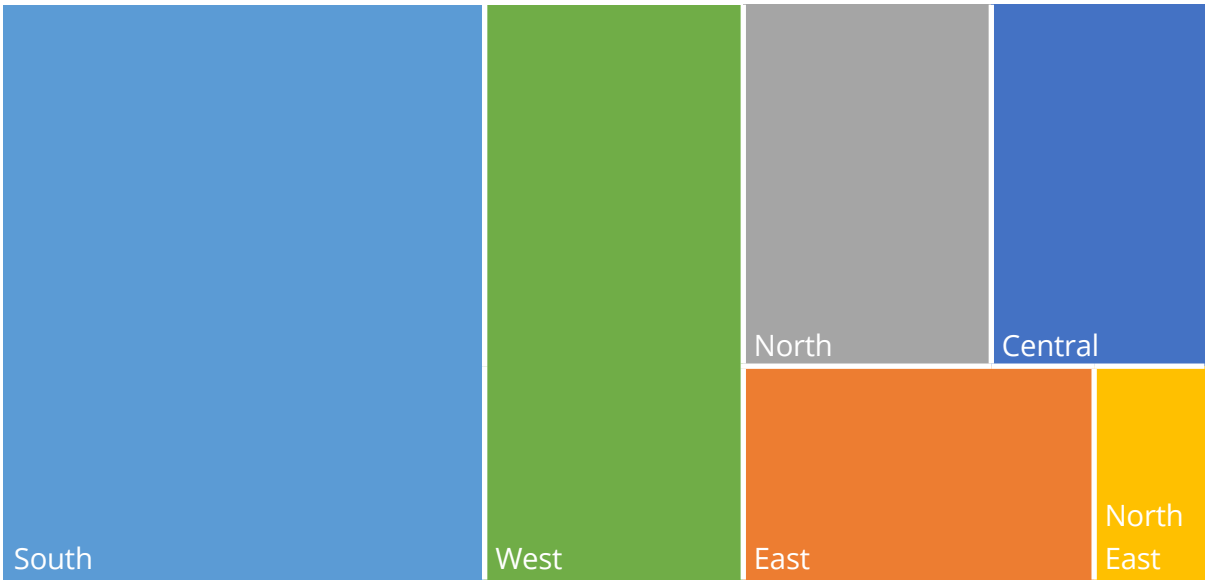
## FIGURE 4: NUMBER OF COVID-19 ACTIVE CASES AND DEATHS IN INDIA (AS OF 1 MARCH 2022)




Source : www.covid19india.org

## COVID-19 INDICATORS: CONFIRMED CASES (AS OF 30 NOVEMBER 2021)

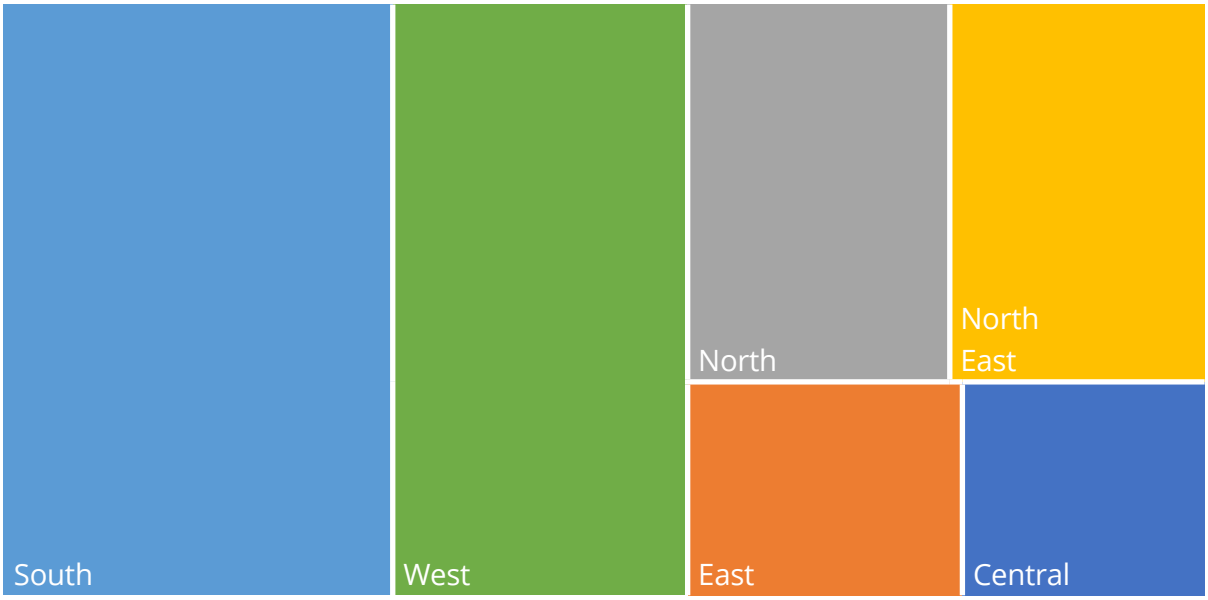
## FIGURE 5: CUMULATIVE CONFIRMED COVID-19 CASES ACROSS INDIA




Source: COVID19bharat.org

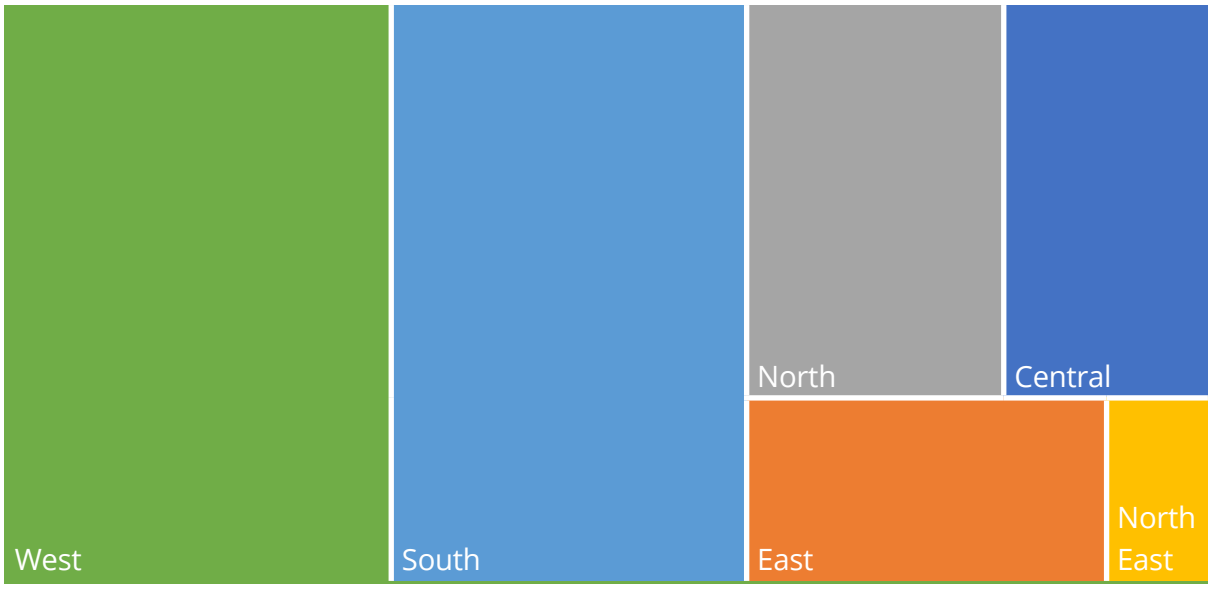
The treemap graphs (Figures 5 and 6) show the COVID-19 cases across the country's states. The bigger the size of the state compartment, the higher is its contribution to the overall number. In absolute terms, Maharashtra, Kerala, Karnataka, and Tamil Nadu have recorded the highest numbers of cases. With respect to population, the caseload burden was remarkably heavier for smaller states and for UTs, such as Lakshadweep, Goa, Mizoram; Kerala, a big state, is an exception.

## FIGURE 6: CONFIRMED COVID-19 CASES ACROSS INDIA PER 100,000 POPULATION




Source: COVID19bharat.org

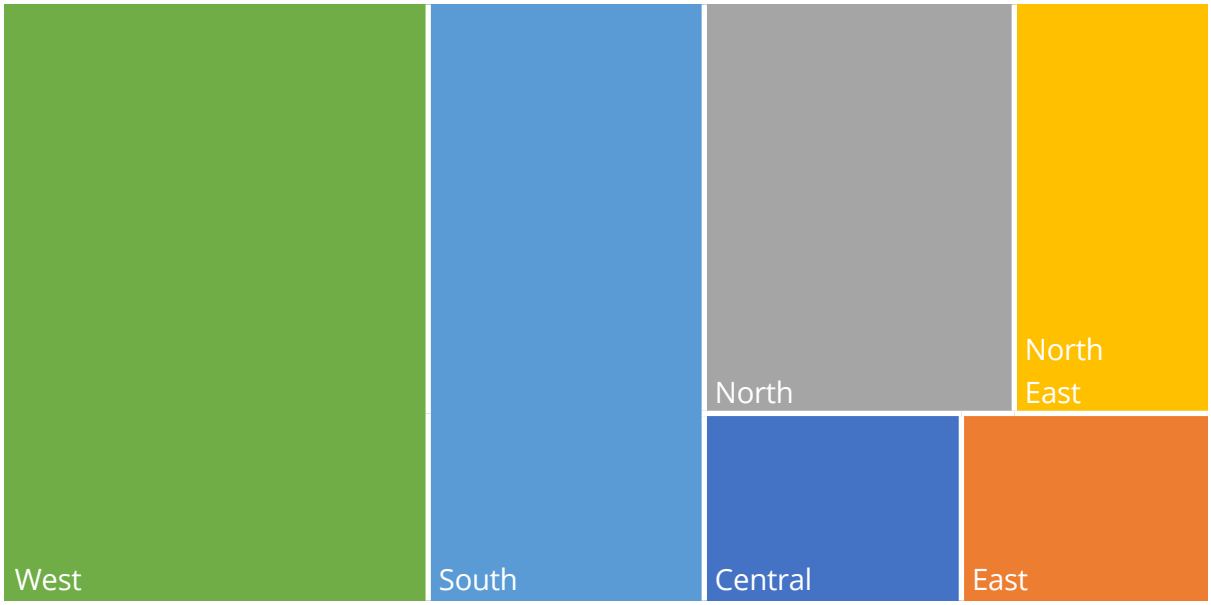
## DEATHS (AS OF 15 DECEMBER 2021)
## FIGURE 7: CUMULATIVE CONFIRMED COVID-19 DEATHS ACROSS INDIA




Source: COVID19bharat.org

Following the same trend as for the cases, the cumulative COVID-19 deaths burden (see Figures 7 and 8) is highest for Maharashtra, followed by Kerala, Karnataka, and Tamil Nadu. The deaths per 100,000 population were significantly higher for Kerala, Maharashtra, Delhi, Goa, and Puducherry.

## FIGURE 8: CONFIRMED COVID-19 DEATHS ACROSS INDIA PER 100,000 POPULATION

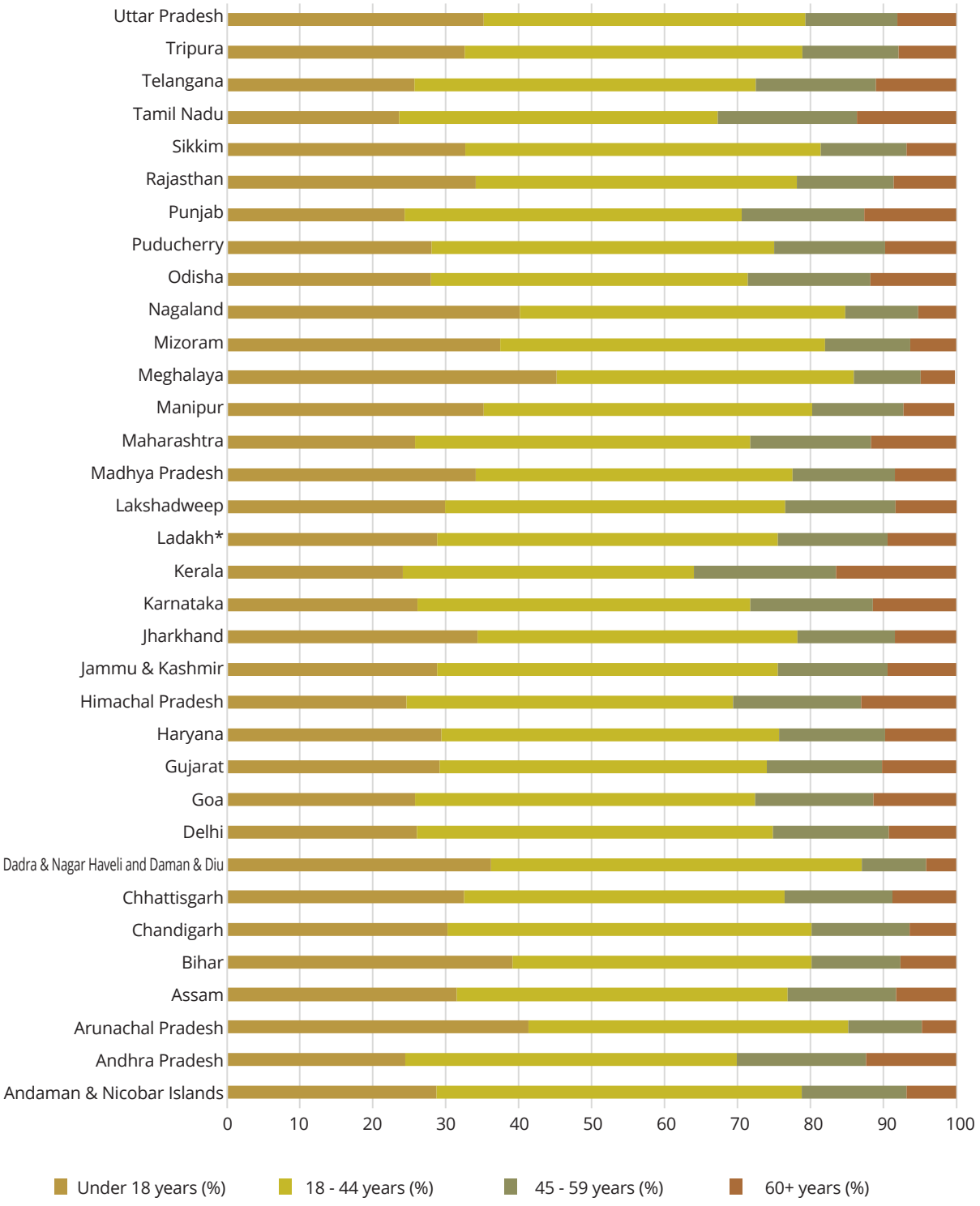



Source: COVID19bharat.org

THE FOLLOWING TRENDS are seen in the state profiles:

i. The age-wise demographics shows that the top three states with the highest estimated proportion of population 60 years and older, are in Kerala, Tamil Nadu, and Himachal Pradesh. Meanwhile, the highest percentage of under-18s is concentrated in the north-eastern region, with Meghalaya, Arunachal Pradesh, and Nagaland leading. With children being the biggest non-immunised demographic group across all populations, India faces the massive task of providing them with safe and effective vaccines against COVID-19.

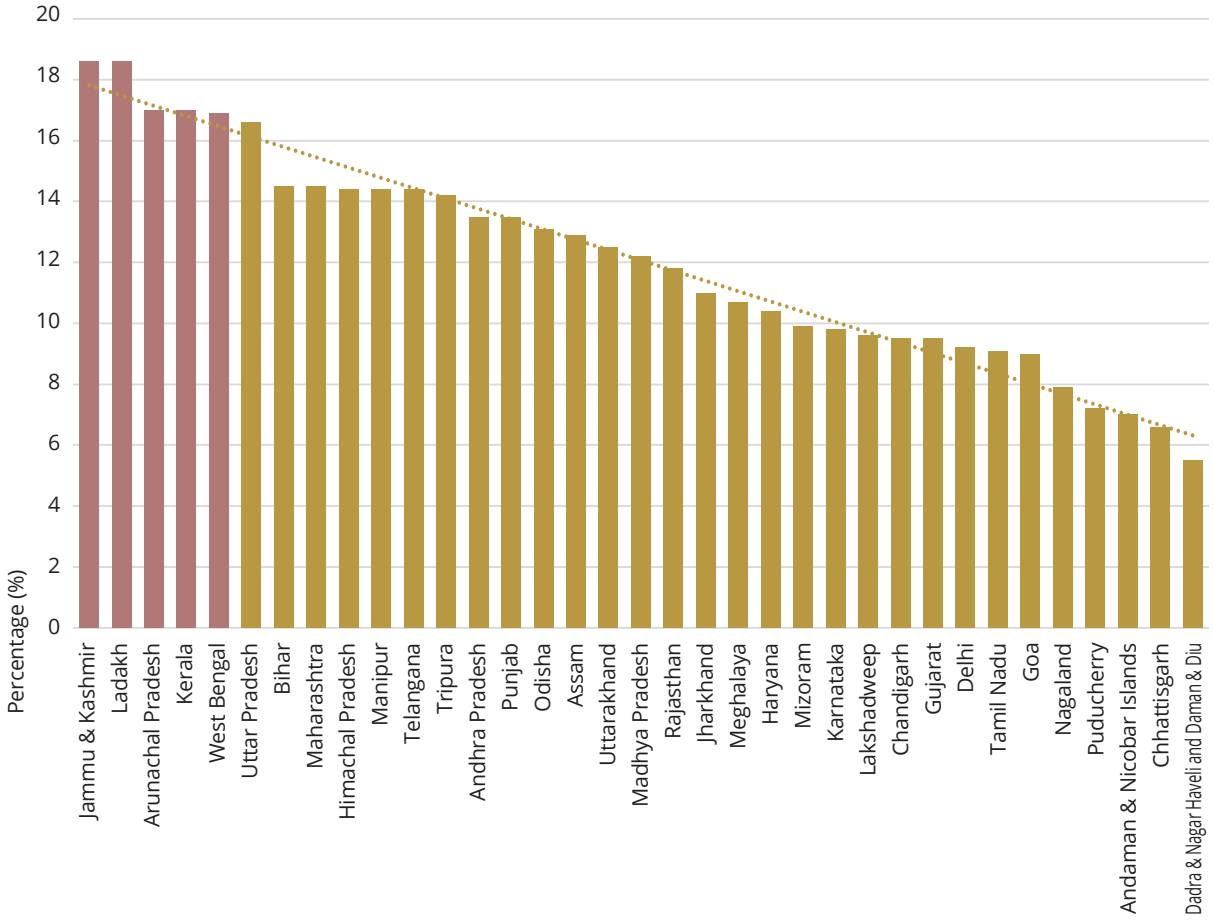
## FIGURE 9: DEMOGRAPHICS ACROSS INDIA'S STATES AND UTs, BY AGE




Source: Report of the Technical Group on Population Projections (2019) for larger states and computed by authors for smaller states

ii. Monthly per-capita out-of-pocket expenditure on health was highest in Jammu and Kashmir and Ladakh (18.6 percent each), followed by Arunachal Pradesh and Kerala (17 percent each). While this indicator reflects poorly on government support for public health, and lack of financial coverage, it can also be interpreted as the population's active healthcare-seeking behaviour.

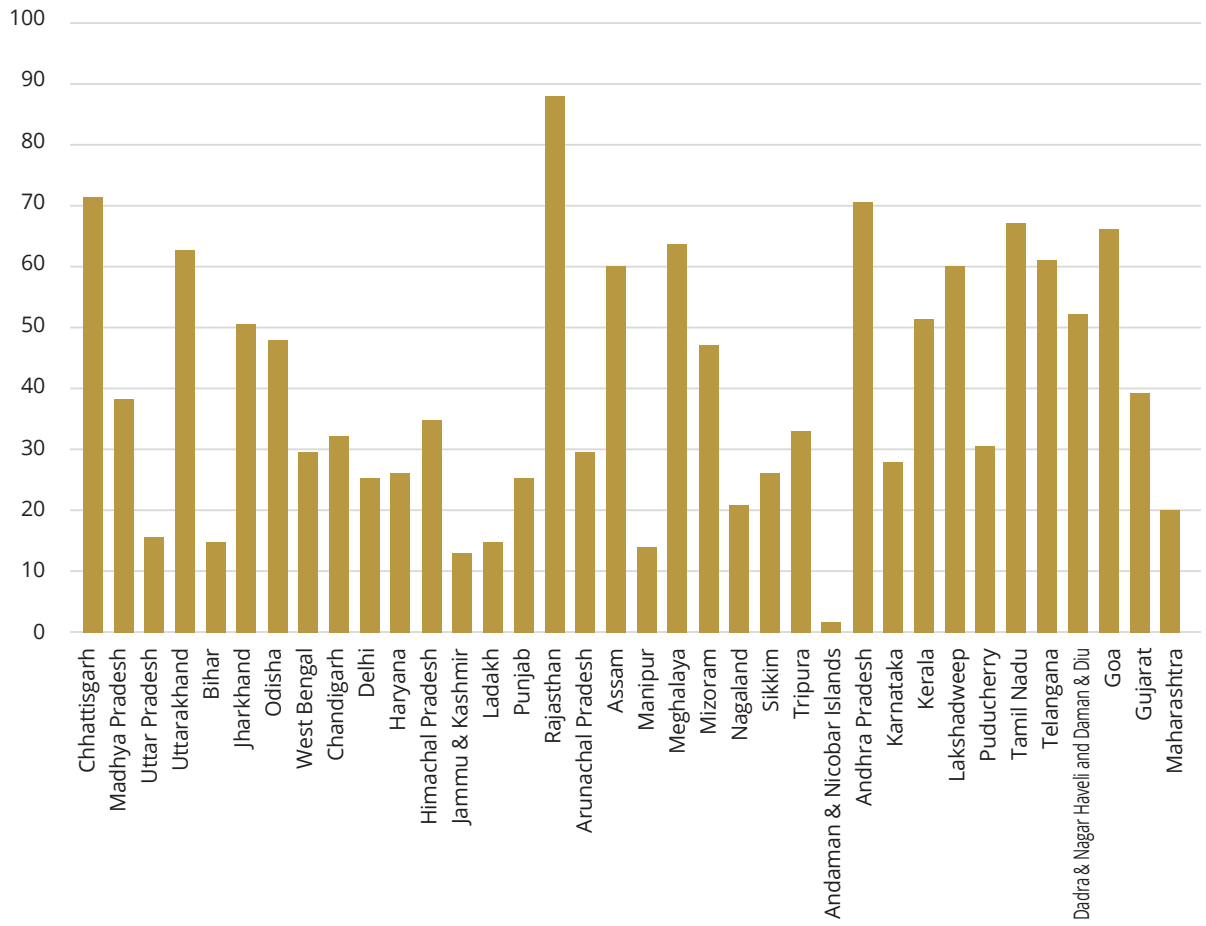
## FIGURE 10: MONTHLY PER CAPITA OUT-OF-POCKET EXPENDITURE ON HEALTH AS A SHARE OF PER CAPITA CONSUMPTION EXPENDITURE ACROSS INDIA




Source: SDG 3 Index (2020)

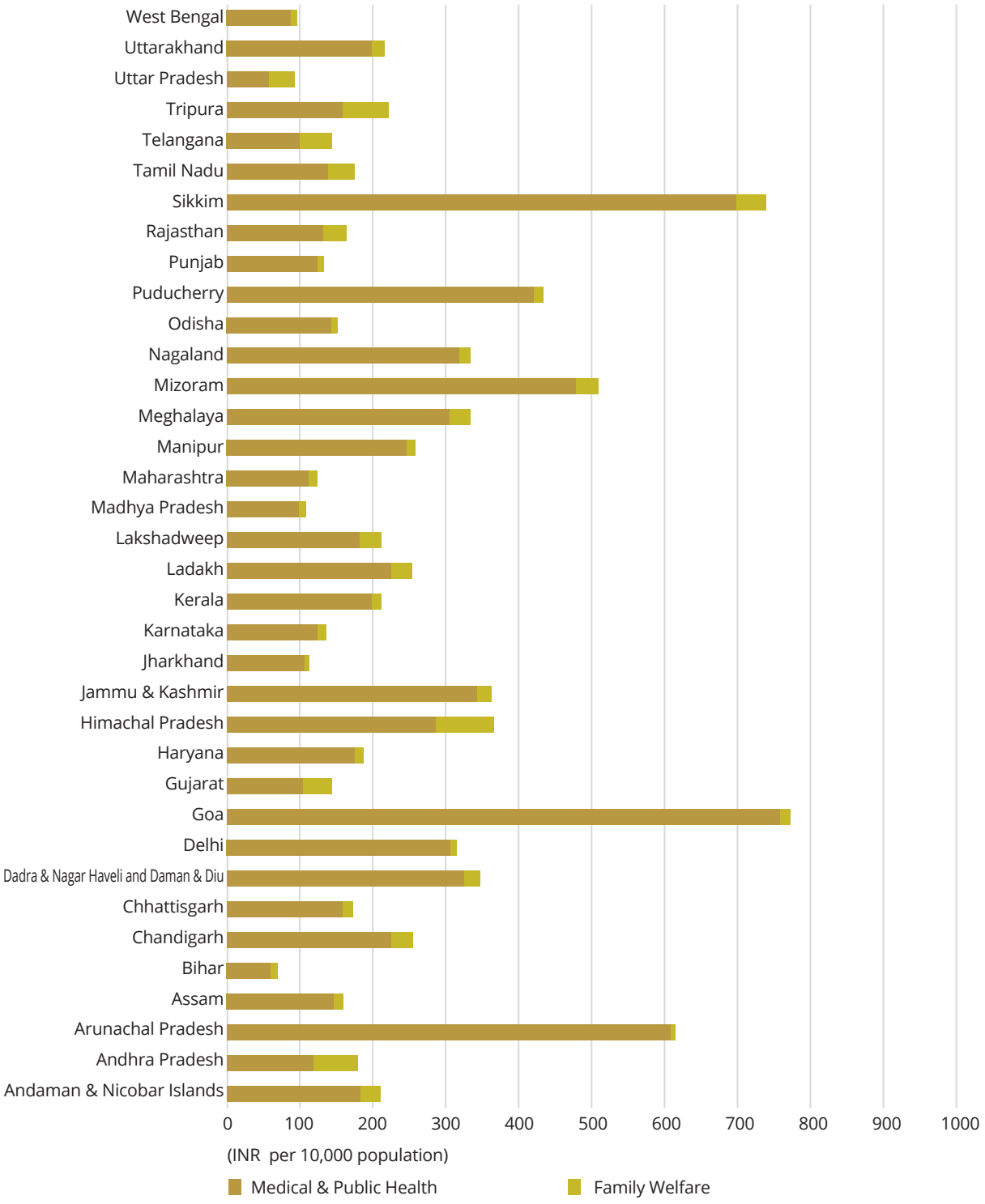
iii. Overall, the coverage of the general population with any kind of health insurance or financing scheme was very low at about 40 percent, as per NFHS-5. Among the states, coverage is highest in Rajasthan (87.8 percent), followed by Chhattisgarh (71.4 percent) and Andhra Pradesh (70.2 percent).

## FIGURE 11: HEALTH INSURANCE OR FINANCING SCHEME COVERAGE ACROSS INDIA




iv. Government support in the form of per capita revenue expenditure in Medical and Public Health and Family Welfare was highest in the smaller states of Sikkim (INR 743.39 per 10,000 population), Goa (INR 778.82), and Arunachal Pradesh (INR 617.83). These are clear outliers from the overall trend across states and UTs in the country, with average revenue expenditure on health at INR 271.26 in 2020-21 and INR 291.43 in 2021-22 per 10,000 population.

## FIGURE 12: PER CAPITA REVENUE EXPENDITURE ON HEALTH ACROSS INDIA




Source: State Finances: Study of Budgets (2020), Reserve Bank of India

v. Human resources in Health: India has 36.3 physicians, nurses, and midwives (taken together) and 10.5 pharmacists per 10,000 population. Kerala's number (115 for physicians, nurses and midwives) is significantly higher than the country's average. Further, four of the top five states in the physicians, nurses and midwives category are from the southern region.

   Meanwhile, the number of registered pharmacists with respect to population is higher in the smaller states and in the UTs. Chandigarh is an outlier, with 33 registered pharmacists per 10,000 people.

vi. Medical infrastructure on the population level: COVID-19 Testing capacities are clearly deficit. Only smaller states and UTs like Ladakh, Lakshadweep, and Goa have at least one testing laboratory or sample collection centres per 10,000 population. Smaller states and UTs such as Arunachal Pradesh, Ladakh, and Andaman & Nicobar Islands are some better-performing regions.

vii. Technological infrastructure: Less than 10 states regularly report gender- and age-wise segregated data. While most states and UTs make available historical outcomes-related data on their dedicated COVID-19 portals, real-time updates on availability of hospital beds, ventilators, and others—which contribute critically to these outcomes—are seldom provided.

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[1] Coronavirus, Worldometers, https://www.worldometers.info/coronavirus/
[2] Ministry of Health and Family Welfare, https://www.mohfw.gov.in/
[3] Tracking SARS-CoV-2 variants, World Health Organization, https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/

# 3

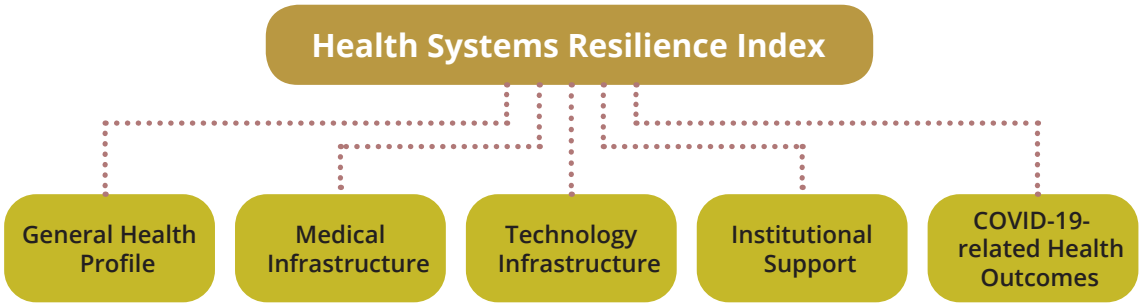
# A Health Systems Resilience Index for India's States and Union Territories

# Structure and Sub-Indices

The prolonged COVID-19 pandemic has served as a "stress test" for India's health systems. Did those systems pass the stress test, or did they fail? More importantly, have those systems been strengthened since, in order for them to become more resilient in the event of subsequent waves of COVID-19, or else another health crisis of similar magnitude?

This section offers answers to these questions in the form of a Health Systems Resilience Index.[1,2] The index will illustrate both, the performance of each of India's 28 states and eight UTs, as they responded to the past waves of the COVID-19 pandemic, and their resilience against future crises. The index uses a nested structure. It comprises five sub-indices that score the Indian states' and UTs' performance across various parameters relating to general health outcomes, medical and technology infrastructure, institutional support, and COVID-19-related health outcomes. The five sub-indices cut across five domains of healthcare infrastructure and impact assessment, particularly relevant for the COVID-19 pandemic. Four of these sub-indices—General Health Profile, Medical Infrastructure, Technology Infrastructure, and Institutional Support—account for the size of the resource base of the states and UTs. Meanwhile, the COVID-19-related Health Outcomes sub-index accounts for the efficiency of resource mobilisation during the preceding two waves of infections, measured using proxies of relevant input and output variables.

FIGURE 14: STRUCTURE OF THE HEALTH SYSTEMS RESILIENCE INDEX




Source: Authors' own

## Sub-Indices: An Overview

**General health profile:** This sub-index provides an aggregate picture of the general health of the population in that state or UT as a baseline case prior to the onset of the pandemic in early 2020. It captures the overall levels of prevailing healthcare services and the associated financial stress on households. It is relevant to study this baseline effect across states and UTs for various reasons. First, poor overall health quality is expected to affect not only the spread of the pandemic but also its outcomes. Second, until very recently, vaccines were available only for the 18+ years age group, which left a sizeable portion of the Indian population unattended during the 2020 and 2021 COVID-19 waves. Lastly, a considerable fraction of the country's health services are shouldered by the private sector; it is necessary to account for the plausible financial stress on individuals and households.

**Medical infrastructure:** The availability of adequate medical infrastructure becomes even more critical amidst a prolonged pandemic such as that of COVID-19. This sub-index measures the pre-pandemic state of health infrastructure across the states and UTs, as well as the burden that the pandemic has placed on these systems and infrastructure, and how quickly the State and the Central governments managed to respond.

**Technology infrastructure:** This component index provides a measure for connectivity, and the availability of relevant infrastructure in a state or UT. These facilitate the distribution of resources and aid in information dissemination. It also incorporates factors such as data availability, ease of accessibility, and granularity of reported data. Efficiency in data reporting enables the system's functioning and informs decision-making and emergency communication.

**Institutional support:** This sub-index measures the support provided by the state to the various institutions that comprise the health sector, which in turn provide the financial and structural backbone for the system at the forefront of the pandemic battle. For this sub-index, it is defined by the per capita revenue expenditure in the healthcare sector of the respective state or UT. Furthermore, to measure the degree of response shown by the state or UT, the changes in public expenditure on healthcare over the two years of the pandemic have also been considered and compared to the "business as usual" scenario.

**COVID-19-related health outcomes:** These parameters help understand the extent of the spread of the pandemic across populations and gauge impacts in terms of health outcomes. The efficiency in mobilising COVID-19 pandemic-induced health infrastructure is measured by using critical indicators such as the time taken by the state or UT to bring down positivity rates or improve vaccination coverage, particularly for the vulnerable elderly, and achieve spatial and gender equity in the inoculation drive. Overall levels of testing and vaccination attained account for the demand for these critical health services among the population. Moreover, testing rates, in conjunction with the number of COVID-19 cases, adjust for under-reporting of numbers by any state or UT.

The composite index consists of both static and dynamic variables to capture changes in responses, and the results of those responses. It therefore emerges as a combination of initial conditions that are reflective of the health preparedness of a sub-national unit, the response mechanism to the pandemic, and the final outcomes. The static variables include General Health Profile, Medical Infrastructure, Technology Infrastructure, and the two revenue expenditure variables under institutional support, and the vaccine doses, tests, deaths, peak daily case load under COVID-19-related health outcomes. Meanwhile, the dynamic variables cover the two related to revenue change under institutional support, and the time taken between the highest peak of daily cases to its 20 percent, time taken between peak positivity rate to fall below 5 percent, days taken to reach benchmark vaccination coverage of 18+ population, and weeks taken to reach benchmark vaccination coverage of 60+ population under COVID-19-related Health Outcomes. (Details on the variables and data sources are given in Table A2 in Appendix 1.)

## Results and Analysis

THE HEALTH SYSTEMS RESILIENCE INDEX (HSRI), including its five component indices, has been computed for all of India's 20 large states,[3] eight small states, and eight Union Territories, using a two-stage weighted average. For the assignment of weights in the first stage, the authors conducted a Principal Component Analysis (PCA) with 33 component indicators. In the second stage, weights were dictated by informed arbitrariness. Subjectively determined weights were assigned driven by the motivation to simultaneously capture variations in capacities and performance of health systems across regions (See Annexure II for detailed data sources and methodology). The following sections will consider the index scores computed across all states and UTs and identify broad trends in terms of performance during the 2020 and 2021 waves of the COVID-19 pandemic. The analysis also uses the computed scores to classify the states and UTs into six degrees of resilience from Low to High. This enables the identification of clustering patterns and, accordingly, traces the factors that have led to such rankings.[4]

### a. Sub-Index 1: General Health Profile

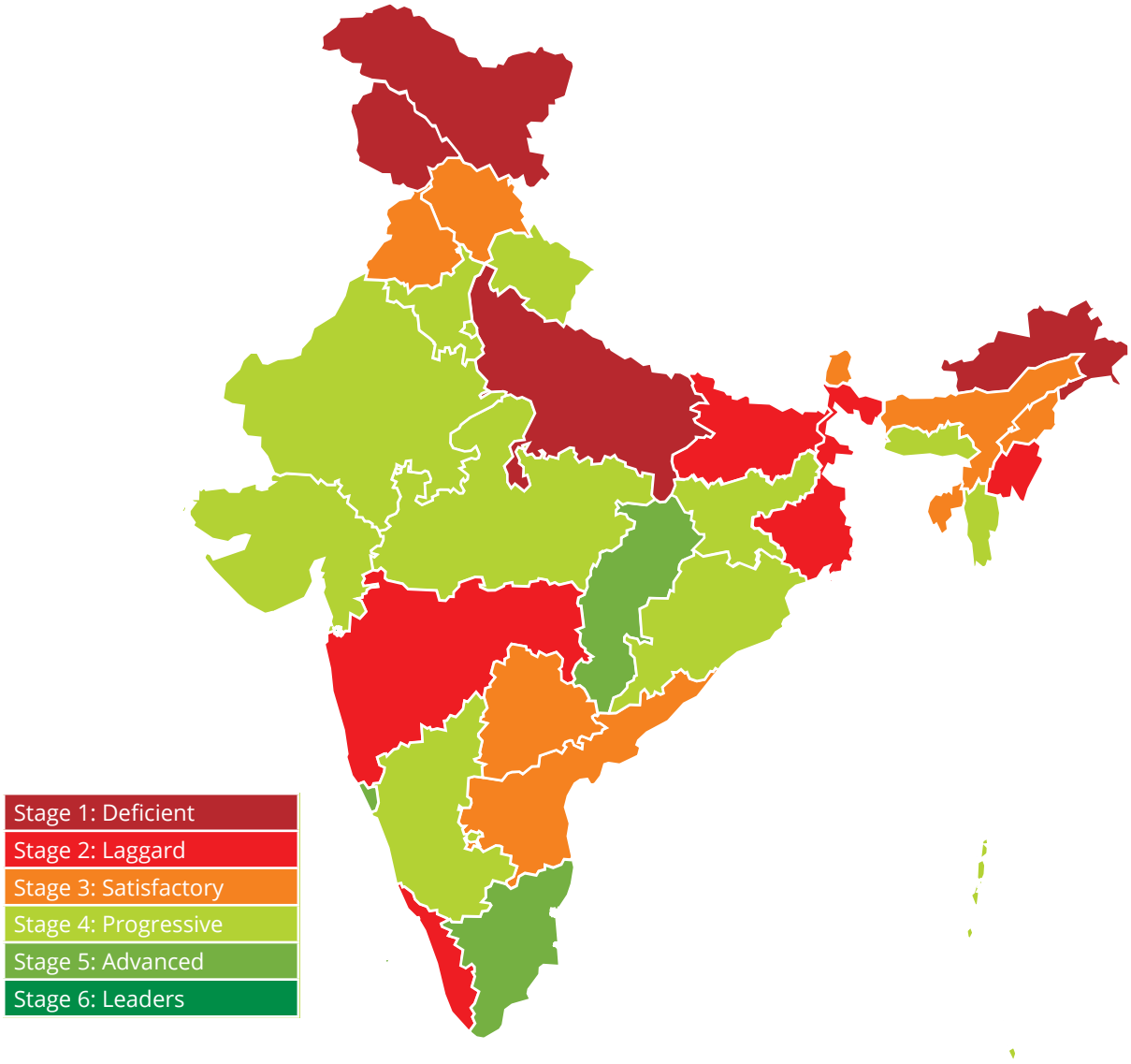
Table 1 shows the computed scores and rankings in the General Health Profile Sub-index for India's 20 large states, eight smaller states, and eight UTs, with 1 being the maximum score and 0, the minimum.

## TABLE 1: GENERAL HEALTH PROFILE INDEX SCORES AND RANKING

| | | |
|---|---|---|
| **Large States** | | |
| Tamil Nadu | 0.86 | 1 |
| Chhattisgarh | 0.82 | 2 |
| Rajasthan | 0.76 | 3 |
| Karnataka | 0.74 | 4 |
| Gujarat | 0.73 | 5 |
| Haryana | 0.68 | 6 |
| Odisha | 0.68 | 7 |
| Jharkhand | 0.68 | 8 |
| Uttarakhand | 0.68 | 9 |
| Madhya Pradesh | 0.62 | 10 |
| Himachal Pradesh | 0.57 | 11 |
| Andhra Pradesh | 0.57 | 12 |
| Telangana | 0.55 | 13 |
| Assam | 0.54 | 14 |
| Punjab | 0.49 | 15 |
| West Bengal | 0.42 | 16 |
| Maharashtra | 0.41 | 17 |
| Bihar | 0.41 | 18 |
| Kerala | 0.35 | 19 |
| Uttar Pradesh | 0.29 | 20 |
| **Small States** | | |
| Goa | 0.81 | 1 |
| Mizoram | 0.72 | 2 |
| Meghalaya | 0.66 | 3 |
| Sikkim | 0.59 | 4 |
| Nagaland | 0.55 | 5 |
| Tripura | 0.44 | 6 |
| Manipur | 0.39 | 7 |
| Arunachal Pradesh | 0.25 | 8 |
| **Union Territories** | | |
| Dadra & Nagar Haveli and Daman & Diu | 0.90 | 1 |
| Lakshadweep | 0.84 | 2 |
| Puducherry | 0.75 | 3 |
| Chandigarh | 0.75 | 4 |
| Delhi | 0.69 | 5 |
| Andaman & Nicobar Islands | 0.66 | 6 |
| Ladakh | 0.33 | 7 |
| Jammu & Kashmir | 0.31 | 8 |

Source: Authors' own

## FIGURE 15: GENERAL HEALTH PROFILE INDEX SCORES OF INDIAN STATES AND UNION TERRITORIES




Among the larger states, Tamil Nadu has the highest score, at 0.86, in terms of general health; of the smaller states, Goa ranks first, with 0.81. Most western and southern states perform relatively well, compared to the rest of India. Kerala and Maharashtra are two regional outliers, having significantly low scores—in Kerala, it is primarily due to catastrophic out-of-pocket expenditure on health, and in Maharashtra, inadequate insurance coverage is mainly to blame. In northern India, all states (except Himachal Pradesh and Punjab) perform considerably well in this domain. Among the eastern and central states, Odisha, Jharkhand and Chhattisgarh perform significantly well. There are no clear regional trends observed among the North-East Region (NER) states. Arunachal Pradesh is at the tail of all the states and UTs, scoring 0.25 in this sub-index. All UTs except the recently formed Ladakh, and Jammu & Kashmir perform well in the "General Health Profile" parameter, with Dadra & Nagar Haveli and Daman & Diu performing best among all states and UTs.

### b. Sub-Index 2: Medical Infrastructure

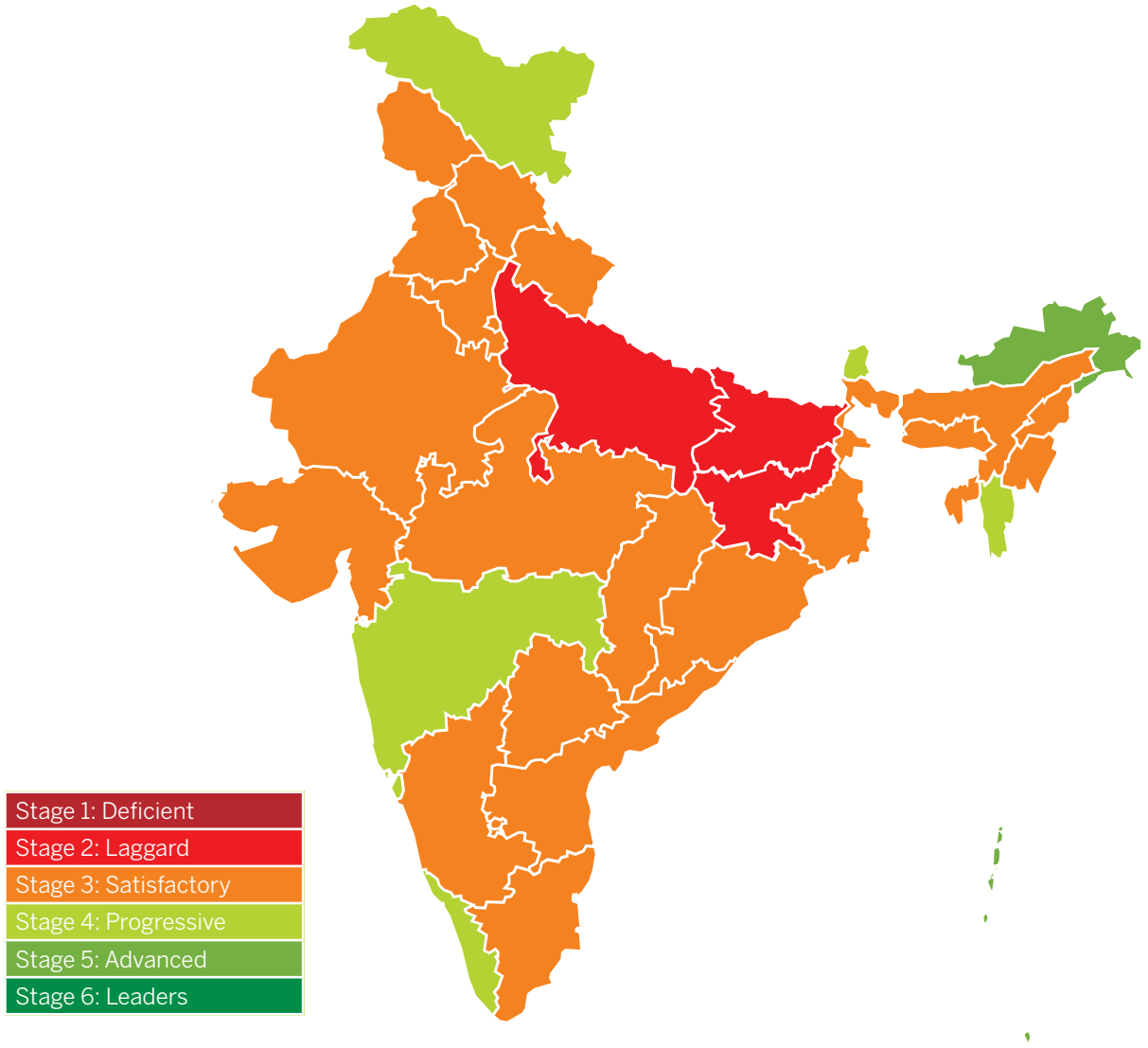
Table 2 shows the computed scores and rankings in the Medical Infrastructure Sub-index for India's 20 large states, eight smaller states, and eight UTs, with 1 being the maximum score and 0, the minimum.

## TABLE 2: MEDICAL INFRASTRUCTURE INDEX SCORES AND RANKING

| | | |
|---|---|---|
| **Large States** | | |
| Kerala | 0.20 | 1 |
| Maharashtra | 0.20 | 2 |
| Karnataka | 0.19 | 3 |
| Uttarakhand | 0.19 | 4 |
| Punjab | 0.17 | 5 |
| Himachal Pradesh | 0.17 | 6 |
| Tamil Nadu | 0.16 | 7 |
| Chhattisgarh | 0.16 | 8 |
| Haryana | 0.15 | 9 |
| Andhra Pradesh | 0.15 | 10 |
| Gujarat | 0.14 | 11 |
| Telangana | 0.12 | 12 |
| Rajasthan | 0.09 | 13 |
| Assam | 0.08 | 14 |
| Odisha | 0.08 | 15 |
| Madhya Pradesh | 0.08 | 16 |
| West Bengal | 0.08 | 17 |
| Jharkhand | 0.04 | 18 |
| Uttar Pradesh | 0.04 | 19 |
| Bihar | 0.02 | 20 |
| **Small States** | | |
| Arunachal Pradesh | 0.38 | 1 |
| Sikkim | 0.25 | 2 |
| Mizoram | 0.25 | 3 |
| Goa | 0.22 | 4 |
| Tripura | 0.17 | 5 |
| Meghalaya | 0.16 | 6 |
| Nagaland | 0.14 | 7 |
| Manipur | 0.14 | 8 |
| **Union Territories** | | |
| Lakshadweep | 0.85 | 1 |
| Andaman & Nicobar Islands | 0.39 | 2 |
| Ladakh | 0.33 | 3 |
| Puducherry | 0.28 | 4 |
| Chandigarh | 0.20 | 5 |
| Delhi | 0.18 | 6 |
| Jammu & Kashmir | 0.16 | 7 |
| Dadra & Nagar Haveli and Daman & Diu | 0.13 | 8 |

Source: Authors' own

## FIGURE 16: MEDICAL INFRASTRUCTURE INDEX SCORES FOR INDIAN STATES AND UNION TERRITORIES




In this parameter, Lakshadweep scores the highest overall, i.e., 0.85, among all states and UTs. Arunachal Pradesh is the best performer among smaller states with a score of 0.38. It is clear that the smaller states and UTs have significantly better medical infrastructure than the larger states. Among the larger states, the average level of medical infrastructure is significantly low, with the states in the south, west, and northern regions slightly outdoing the eastern and central states. Kerala ranks the highest among the large states while Bihar, with 0.02, scores the lowest among all states and UTs.

### c. Sub-Index 3: Technology Infrastructure

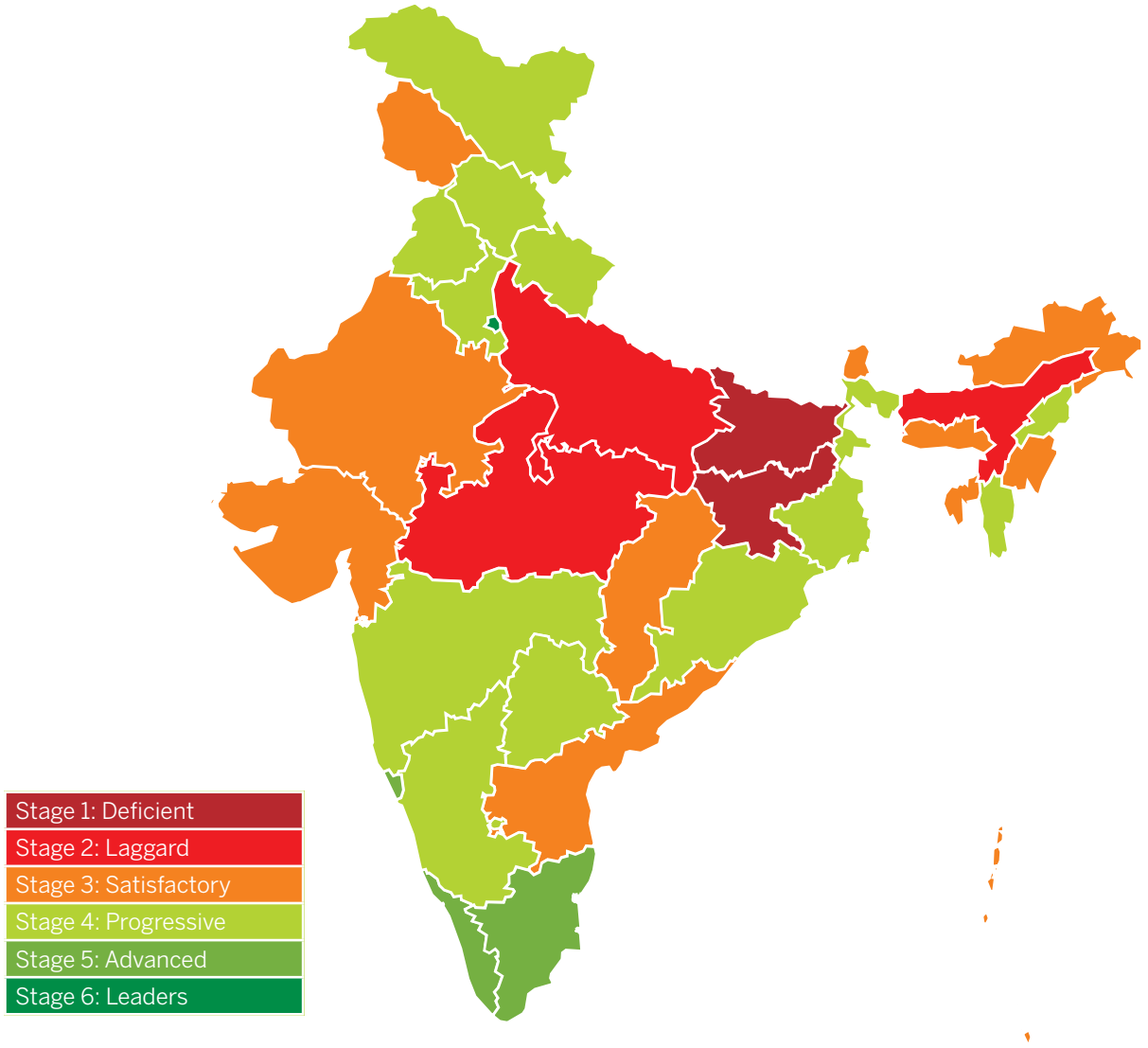
Table 3 shows the computed scores and rankings in the Technology Infrastructure Sub-index for India's 20 large states, eight smaller states, and eight UTs, with 1 being the maximum score and 0, the minimum.

## TABLE 3: TECHNOLOGY INFRASTRUCTURE INDEX SCORES AND RANKING

| | | |
|---|---|---|
| **Large States** | | |
| Tamil Nadu | 0.53 | 1 |
| Kerala | 0.52 | 2 |
| Telangana | 0.46 | 3 |
| Himachal Pradesh | 0.45 | 4 |
| Haryana | 0.41 | 5 |
| Karnataka | 0.40 | 6 |
| Maharashtra | 0.37 | 7 |
| Punjab | 0.36 | 8 |
| Odisha | 0.34 | 9 |
| Uttarakhand | 0.33 | 10 |
| West Bengal | 0.33 | 11 |
| Gujarat | 0.30 | 12 |
| Andhra Pradesh | 0.28 | 13 |
| Rajasthan | 0.20 | 14 |
| Chhattisgarh | 0.19 | 15 |
| Assam | 0.15 | 16 |
| Madhya Pradesh | 0.10 | 17 |
| Uttar Pradesh | 0.10 | 18 |
| Jharkhand | 0.06 | 19 |
| Bihar | 0.04 | 20 |
| **Small States** | | |
| Goa | 0.55 | 1 |
| Nagaland | 0.40 | 2 |
| Mizoram | 0.35 | 3 |
| Manipur | 0.31 | 4 |
| Meghalaya | 0.26 | 5 |
| Arunachal Pradesh | 0.25 | 6 |
| Tripura | 0.23 | 7 |
| Sikkim | 0.20 | 8 |
| **Union Territories** | | |
| Delhi | 0.83 | 1 |
| Chandigarh | 0.48 | 2 |
| Ladakh | 0.37 | 3 |
| Andaman & Nicobar Islands | 0.31 | 4 |
| Jammu & Kashmir | 0.30 | 5 |
| Puducherry | 0.27 | 6 |
| Lakshadweep | 0.22 | 7 |
| Dadra & Nagar Haveli and Daman & Diu | 0.21 | 8 |

Source: Authors' own

## FIGURE 17: TECHNOLOGY INFRASTRUCTURE INDEX SCORES FOR INDIAN STATES AND UNION TERRITORIES




While technological infrastructure and innovations do not directly contribute to health outcomes, they can enhance the working efficiency of a system. A laggard performance in this domain can severely impact the overall resilience of a state or UT, despite adequate responses in other domains.

Delhi performs exceedingly well in this sub-index, scoring 0.83. Indeed, most northern states except Rajasthan, most southern states except Andhra Pradesh, and most western states except Gujarat, wielded technology effectively in their pandemic response in 2020 and 2021. Larger states in the central and eastern regions have lagged considerably in this domain. Notably, Odisha and West Bengal have outperformed the other eastern states. Among the smaller states, Goa scores the highest in this sub-index, at 0.55. Five of the eight small states in the NER had less remarkable tech responses. Unlike in the other parameters, the UTs (except Delhi) score relatively lower in this sub-index.

### d. Sub-Index 4: Institutional Support

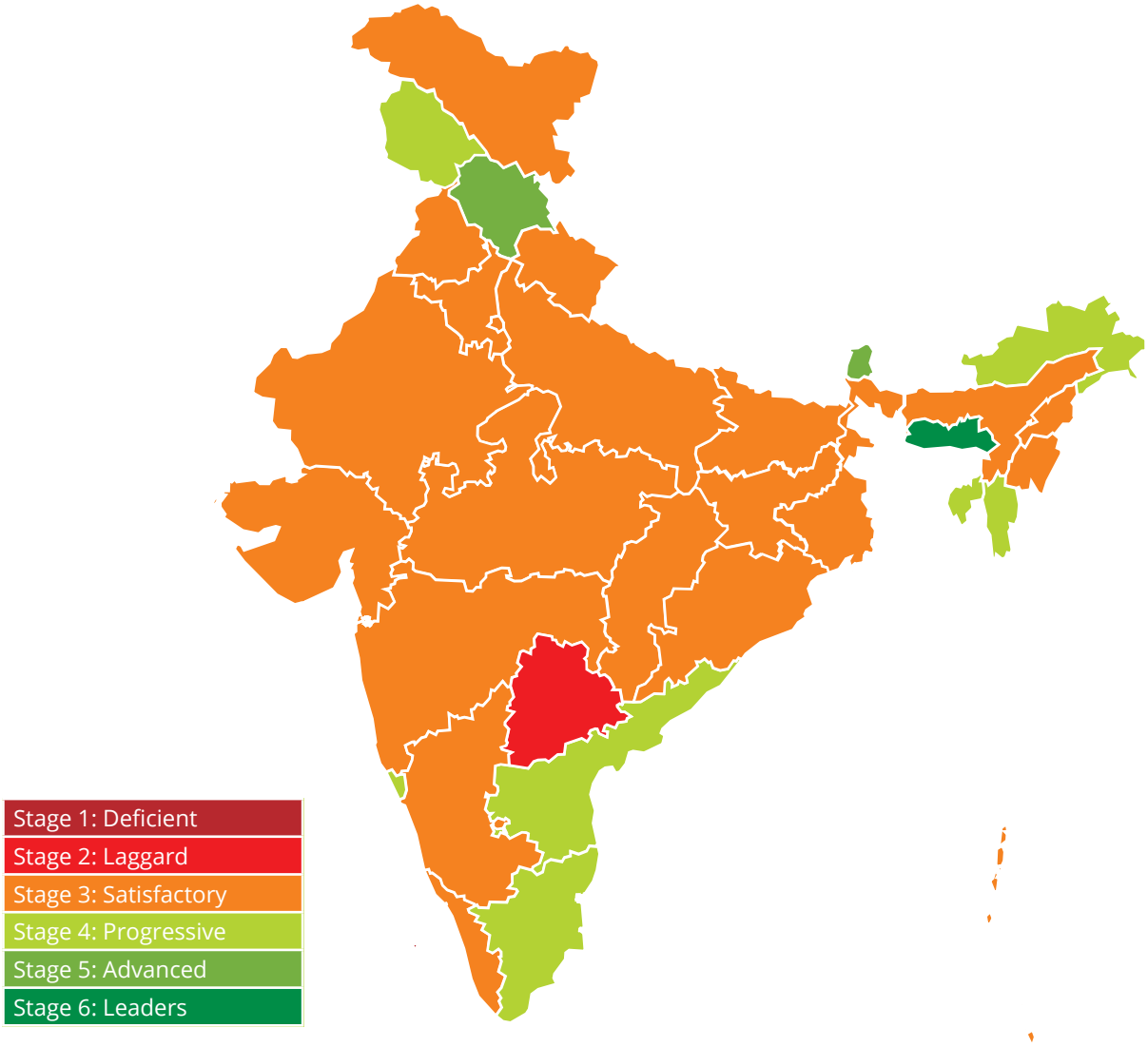
Table 4 shows the computed scores and rankings in the Institutional Support Sub-index for India's 20 large states, eight smaller states, and eight UTs, with 1 being the maximum score and 0, the minimum.

## TABLE 4: INSTITUTIONAL SUPPORT INDEX SCORES AND RANKING

| | | |
|---|---|---|
| **Large States** | | |
| Himachal Pradesh | 0.34 | 1 |
| Andhra Pradesh | 0.29 | 2 |
| Tamil Nadu | 0.25 | 3 |
| Rajasthan | 0.21 | 4 |
| Gujarat | 0.19 | 5 |
| Uttarakhand | 0.19 | 6 |
| Kerala | 0.19 | 7 |
| Odisha | 0.17 | 8 |
| Karnataka | 0.17 | 9 |
| West Bengal | 0.17 | 10 |
| Chhattisgarh | 0.17 | 11 |
| Haryana | 0.16 | 12 |
| Assam | 0.16 | 13 |
| Maharashtra | 0.15 | 14 |
| Uttar Pradesh | 0.15 | 15 |
| Bihar | 0.14 | 16 |
| Punjab | 0.14 | 17 |
| Jharkhand | 0.13 | 18 |
| Madhya Pradesh | 0.13 | 19 |
| Telangana | 0.11 | 20 |
| **Small States** | | |
| Meghalaya | 0.77 | 1 |
| Sikkim | 0.37 | 2 |
| Tripura | 0.31 | 3 |
| Goa | 0.31 | 4 |
| Mizoram | 0.30 | 5 |
| Arunachal Pradesh | 0.27 | 6 |
| Nagaland | 0.20 | 7 |
| Manipur | 0.20 | 8 |
| **Union Territories** | | |
| Jammu & Kashmir | 0.25 | 1 |
| Puducherry | 0.22 | 2 |
| Chandigarh | 0.22 | 3 |
| Ladakh | 0.22 | 4 |
| Dadra & Nagar Haveli and Daman & Diu | 0.22 | 5 |
| Delhi | 0.21 | 6 |
| Andaman & Nicobar Islands | 0.21 | 7 |
| Lakshadweep | 0.21 | 8 |

Source: Authors' own

## FIGURE 18: INSTITUTIONAL SUPPORT INDEX SCORES FOR INDIAN STATES AND UNION TERRITORIES




Meghalaya has done exceedingly well in terms of public provisioning of healthcare over the first two waves of the pandemic, scoring 0.77 in this sub-index. Goa and other smaller states in the NER, as well as the UTs have performed better in this domain, on average, than the larger states, with their sub-index scores hovering between 0.37 and 0.20. Among the larger states, Himachal Pradesh in the north (0.34) and Andhra Pradesh in the south (0.29) have done relatively better in providing institutional support. In this case, the large size of these states, scaled in terms of population, could have had a significant role in straining institutional efforts, thereby reducing the overall preparedness of the general population in these states. Telangana scores the lowest, at 0.11, among all states and UTs taken together.

### e. Sub-Index 5: COVID-19-related Health Outcomes

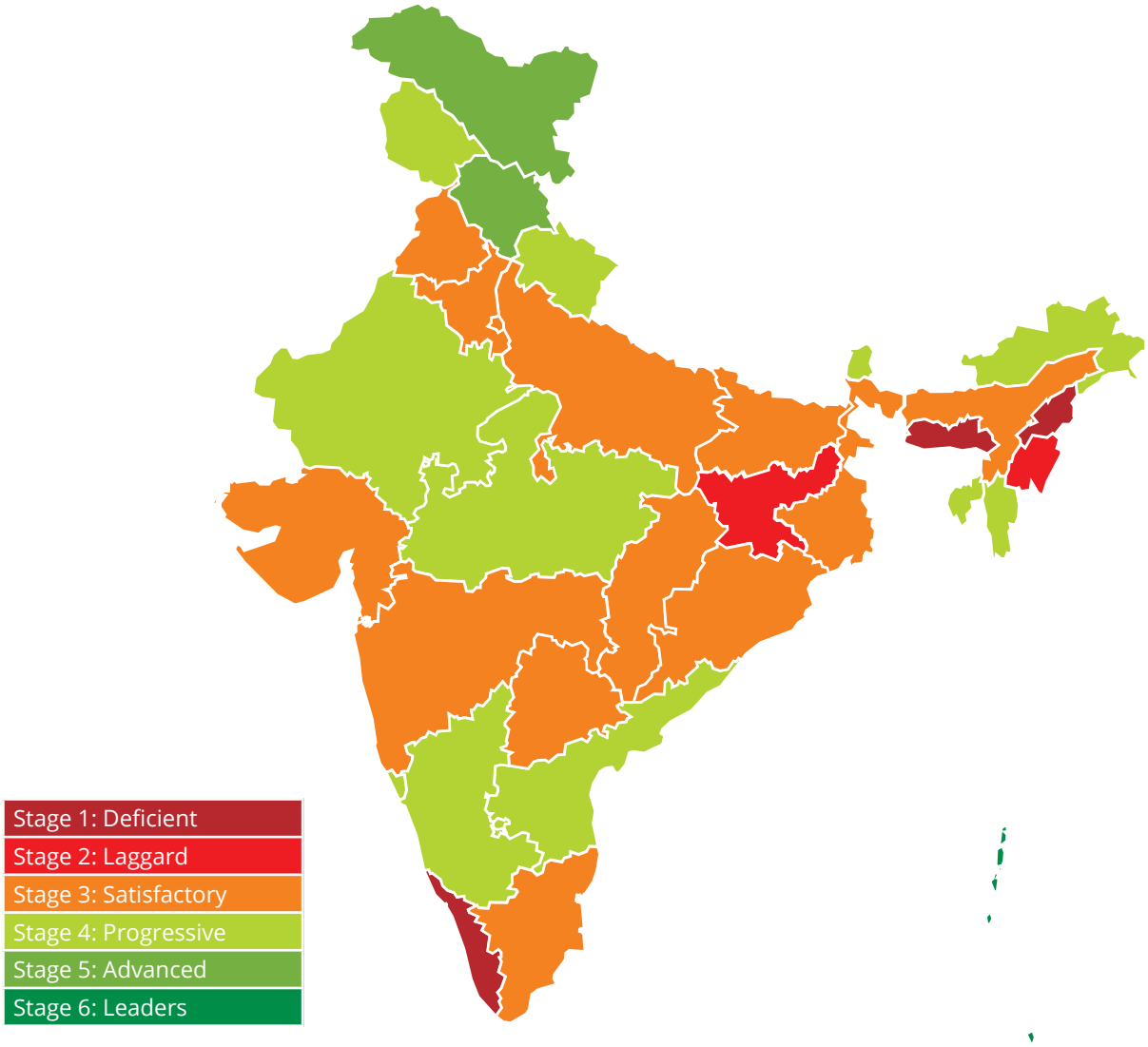
Table 5 shows the computed scores and rankings in the COVID-19-related Health Outcomes Sub-index for India's 20 large states, eight smaller states, and eight UTs, with 1 being the maximum score and 0, the minimum.

## TABLE 5: COVID-19-RELATED HEALTH OUTCOMES INDEX SCORES AND RANKING

| | | |
|---|---|---|
| **Large States** | | |
| Himachal Pradesh | 0.77 | 1 |
| Uttarakhand | 0.69 | 2 |
| Rajasthan | 0.66 | 3 |
| Andhra Pradesh | 0.65 | 4 |
| Karnataka | 0.64 | 5 |
| Madhya Pradesh | 0.62 | 6 |
| Gujarat | 0.61 | 7 |
| Haryana | 0.61 | 8 |
| Chhattisgarh | 0.59 | 9 |
| Assam | 0.58 | 10 |
| Odisha | 0.57 | 11 |
| West Bengal | 0.57 | 12 |
| Bihar | 0.57 | 13 |
| Telangana | 0.56 | 14 |
| Tamil Nadu | 0.54 | 15 |
| Punjab | 0.52 | 16 |
| Maharashtra | 0.52 | 17 |
| Uttar Pradesh | 0.51 | 18 |
| Jharkhand | 0.49 | 19 |
| Kerala | 0.43 | 20 |
| **Small States** | | |
| Goa | 0.72 | 1 |
| Tripura | 0.71 | 2 |
| Mizoram | 0.69 | 3 |
| Sikkim | 0.67 | 4 |
| Arunachal Pradesh | 0.66 | 5 |
| Manipur | 0.45 | 6 |
| Meghalaya | 0.38 | 7 |
| Nagaland | 0.36 | 8 |
| **Union Territories** | | |
| Lakshadweep | 0.87 | 1 |
| Andaman & Nicobar Islands | 0.84 | 2 |
| Ladakh | 0.77 | 3 |
| Chandigarh | 0.70 | 4 |
| Jammu & Kashmir | 0.69 | 5 |
| Dadra & Nagar Haveli and Daman & Diu | 0.57 | 6 |
| Puducherry | 0.56 | 7 |
| Delhi | 0.52 | 8 |

Source: Authors' own

## FIGURE 19: COVID-19-RELATED HEALTH OUTCOMES INDEX SCORES ACROSS INDIAN STATES AND UNION TERRITORIES




Among all states and UTs, Lakshadweep and Andaman & Nicobar Islands, with a score of 0.87 and 0.84, respectively, were most effective in the management of health outcomes during the first two waves of the COVID-19 pandemic. Himachal Pradesh, with a score of 0.77, was the best performer among the larger states, closely followed by the smaller states of Goa, in the west, and Tripura in the north-east. Among the southern states, Kerala scores low, owing primarily to high death rates and low levels of efficiency in resource mobilisation despite a considerably large resource base of supporting infrastructure. Some smaller states in the north-eastern region, such as Manipur, Meghalaya, and Nagaland, score significantly lower compared to their neighbours. Among the UTs, Delhi has lagged behind in effective management of the crisis, scoring the lowest (0.52) in this sub index. While this provides

a broader picture of the relative performance of states and UTs in this domain, a closer inspection of the component indicators may indicate significant under-reporting of cases and deaths in some regions—which in turn may have affected the overall rankings of the states and UTs.

## Overall Health Systems Resilience Index

TABLE 6 SHOWS the computed scores and rankings in the final Health Systems Resilience Index for India's 20 large states, eight smaller states, and eight UTs, with 1 being the maximum score and 0, the minimum.

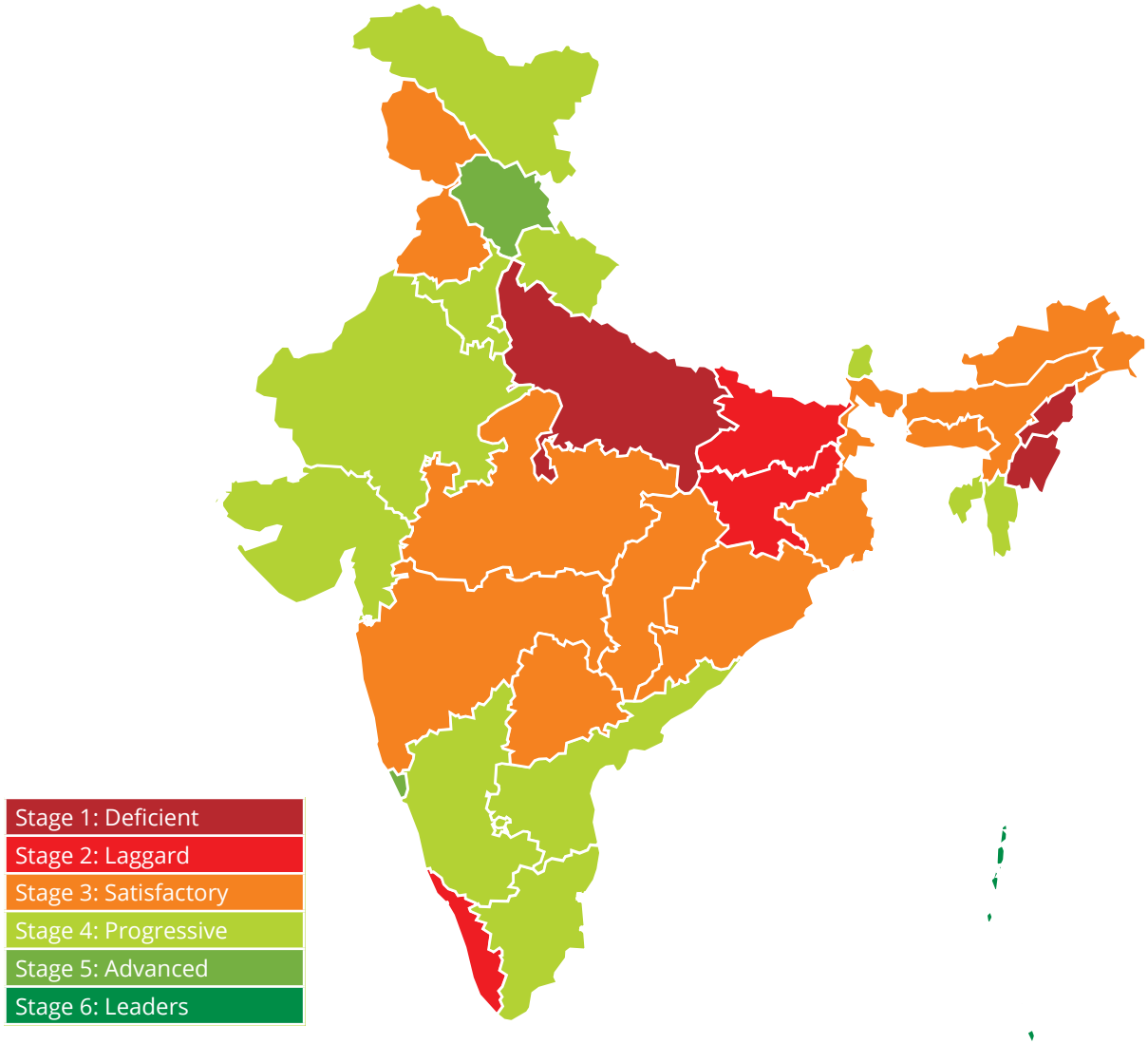
### TABLE 6: HEALTH SYSTEMS RESILIENCE INDEX SCORES AND RANKING

| Large States | | |
|---|---|---|
| Himachal Pradesh | 0.58 | 1 |
| Uttarakhand | 0.52 | 2 |
| Karnataka | 0.51 | 3 |
| Tamil Nadu | 0.50 | 4 |
| Rajasthan | 0.49 | 5 |
| Andhra Pradesh | 0.49 | 6 |
| Haryana | 0.48 | 7 |
| Gujarat | 0.48 | 8 |
| Chhattisgarh | 0.46 | 9 |
| Odisha | 0.44 | 10 |
| Telangana | 0.44 | 11 |
| Madhya Pradesh | 0.42 | 12 |
| West Bengal | 0.41 | 13 |
| Assam | 0.41 | 14 |
| Punjab | 0.40 | 15 |
| Maharashtra | 0.40 | 16 |
| Kerala | 0.37 | 17 |
| Bihar | 0.36 | 18 |
| Jharkhand | 0.36 | 19 |
| Uttar Pradesh | 0.33 | 20 |
| **Small States** | | |
| Goa | 0.59 | 1 |
| Mizoram | 0.55 | 2 |
| Sikkim | 0.51 | 3 |
| Tripura | 0.50 | 4 |
| Arunachal Pradesh | 0.47 | 5 |
| Meghalaya | 0.42 | 6 |
| Manipur | 0.35 | 7 |
| Nagaland | 0.34 | 8 |

| Union Territories | | |
|---|---|---|
| Lakshadweep | 0.70 | 1 |
| Andaman & Nicobar Islands | 0.61 | 2 |
| Chandigarh | 0.56 | 3 |
| Ladakh | 0.54 | 4 |
| Delhi | 0.50 | 5 |
| Puducherry | 0.47 | 6 |
| Jammu & Kashmir | 0.47 | 7 |
| Dadra & Nagar Haveli and Daman & Diu | 0.47 | 8 |

Source: Authors' own

## FIGURE 20: HEALTH SYSTEMS RESILIENCE INDEX SCORES FOR INDIAN STATES AND UNION TERRITORIES



Lakshadweep and Andaman and Nicobar Islands, among the UTs, have more resilient health systems in place, scoring 0.70 and 0.61 in the composite index, respectively. Among the smaller states, the best performer is Goa (0.59) and of the larger states, Himachal Pradesh (0.58) ranks first. All other UTs are 'satisfactory' or 'progressive' in the measure of resilience of their health systems, with their index scores hovering between 0.56 to 0.47. Most states in the west (except Maharashtra) and most states in the south (except Kerala) have performed better than the eastern and central states.

States like Uttar Pradesh and Bihar, despite exhibiting satisfactory performance in terms of COVID-19–related health outcomes, have a very low resource base that affects the overall resilience of their health systems. Uttar Pradesh ranks last in the overall index, scoring 0.33; Bihar scores 0.36 and is 18th of the 20 larger states. It needs to be noted here that there was rapid response from UP to spur up its resource base during the pandemic, but the state was already operating from a low base that affected its scores. In the northern region, Punjab has the lowest score – exhibiting low health systems resilience – due to its moderate achievements in general health profile and medical infrastructure. The significantly low institutional support also affected its performance in the 2020 and 2021 waves of the pandemic.

## States and Union Territories: Crucial Patterns

AS THE SCORES OF all the states and UTs in the Health Resilience Index show, specific regions tend to share certain patterns in how well their health systems responded to the first two waves of the COVID-19 pandemic. For example, most states in the southern and western region have scored significantly well across domains, compared to the eastern and central states. The northern states, on the other hand, have not only established a sound resource base but also translated them into effective pandemic management responses. There also appears to be a clusterisation among the union territories, on one hand, and the states, on the other. Across all domains (except institutional support), union territories score better than the states on an average. In some cases, this trend towards clusterisation is also visible among the larger states, and the smaller ones.

The authors pursued this line of enquiry by comparing the average degree of preparedness between the two sets of clusters: the larger states and the smaller states, as well as the states and the UTs. The instrument used for this part of the analysis is a mean-difference test through the t-statistic. The results for the t-test (that checked for equality between two groups of sample means) are summarised in the Annexure IV (See Table A3 and A4).

The results indicate that there is no statistically significant difference in the average levels of resilience of health systems between the larger states and the smaller ones. However, there is more ease of operation and greater efficiency in the UTs than the states, owing to both, initial conditions and better resource mobilisation by the Centre. The ease with which the Centre launched its operational interventions also helped, in turn influencing overall health governance in the union territories. Efforts in mitigating the impacts of the pandemic have been notably more coherent in the UTs, thereby reducing their overall associated transaction costs and achieving higher levels of efficiency.

There is a case to be made, therefore, for strengthening what analysts call "cooperative federalism"—i.e., better Centre-State collaboration–as the lynchpin of any response mechanism to a crisis. A primary area of cooperation should be finance, which is critical for public provisioning and infrastructure development. India's states are inherently different from one other and are faced with their own specific constraints when it comes to allocating funds for crisis management and disbursing them. Immediate and adequate central funding should be made available as "block grants" for the states to draw upon when necessary. These can effectively relieve some of the constraints and help the states prepare better for another surge in COVID-19 cases or any other health crisis of a similar nature.

## Income Levels and Health Systems Resilience

THIS SECTION INVESTIGATES the relationship between the per-capita income levels of the states and UTs, and the overall levels of resilience of their health systems. It is hypothesised that the resilience of the state or UT is positively related to the per-capita income level: that access to resources, or lack of it, directly influences how steadfast a state or UT can be when faced with a massive crisis.[5] The authors used the correlation coefficient between the per-capita Net State Domestic Product (NSDP) and the Health Systems Resilience Index (HSRI) score to test the validity of this hypothesis. The results of the test are summarised in the Annexure V (see Table A5). The correlation coefficient between per-capita income levels and the HSRI scores is 0.63, indicating a moderately strong positive correlation between the two variables.

Such a correlation is bidirectional: States with more resources are likely going to be better prepared for subsequent bouts with a prolonged COVID-19 pandemic, or any other future shock to the healthcare sector; in turn, as a state or UT is better able to mitigate the fallout of a health crisis, they will likely be able to maintain economic activities and thereby minimise the ramifications on their income.

It is essential to acknowledge, to begin with, the critical role of economic performance in ensuring the availability of adequate resources. Promoting efficiency among the states and UTs, guided by the principles of competitive federalism,[6] can raise overall income levels and create opportunities for infrastructure development, public provisioning and private sector investments in healthcare services, and consequently, the resilience of the general population. A more targeted econometric analysis will be required to interrogate this bidirectional causality between state/UT incomes and health systems resilience.

[1] Here, in addition to referring to already established scales of states' performances such as the Bare Necessities Index (Economic Survey 2020, Ministry of Finance) and the SDG India Index (2020), particularly, the progress along SDG 3: Good Health and Well-being, the authors attempt to construct a composite index to assess the preparedness of the Indian states and union territories (UTs) to combat a potential third wave of the Covid-19 pandemic. Indices provide decision-makers with an integrated and informative overview that would be otherwise difficult, if at all possible (Hammond et al. 1995; Neimeijer 2002). This index can provide an objective mode for developing a comprehensive understanding of individual state/UT's preparedness by bringing together all the parameters under study to arrive at an aggregate score. The objective is to move from multiple indicators to a single metric (Hajkowicz 2006). Besides, indexation can provide a better ground for assessing the relative performance of all the states and union territories and identify existing trends of clusterisations or pockets of performance.

[2] Keeney and Raiffa (1976) suggest that during certain decision analyses that require making informed choices about multiple objectives, the preferences of the decision-maker are represented numerically through utility function. The weighted SDG index developed by Ghosh et al. (2019) is an example of one such index. In this context, while the Covid-19 Preparedness Index will allow for an overall ranking of the Indian states/UTs' preparedness to combat any following surge in Covid-19 cases, the 5 sub-indices will enable us to track back on factors that are more relevant for better Covid-19 preparedness and identify specific areas which individual states/UTs need to focus on to improve their performance. As such, this index can provide effective learnings for the Indian states/UTs and improve their efficiency towards combating a potential third wave.

[3] Based on the computed scores, the Indian states and union territories have been grouped into three categories – large states, small states, and union territories (as classified in Government of India reports) - for ranking purposes to ensure fair comparison between similar entities.

[4] To delineate the scores into corresponding classes, we use the following classification criteria (assuming that the index scores are normally distributed):

Stage 1: Deficient -Index scores $<\mu - 1.5^* \sigma$

Stage 2: Laggard - $\mu - 1.5^* \sigma <$ Index scores $<\mu - \sigma$

Stage3: Satisfactory - $\mu - \sigma <$ Index scores $<\mu$

Stage 4: Progressive - $\mu <$ Index scores $<\mu + \sigma$

Stage 5: Advanced - $\mu +$ < Index scores $<\mu + 1.5^* \sigma$

Stage 6: Leaders - $\mu + 1.5^* \sigma <$ Index scores

Where,

$\mu$ is the mean of the scores across the states/UTs;

$\sigma$ is the standard deviation of the scores across the states/UTs.

[5] Simon Lange, Sebastian Vollmer, "The effect of economic development on population health: a review of the empirical evidence", *British Medical Bulletin*, 121 (1), January 2017, Pp. 47–60, https://doi.org/10.1093/bmb/ldw052

[6] Competitive federalism is considered as a renewed sense of positive competition among the sub-national economies as a method to enhance efficiency, allow for greater accountability and independence, and induce corrective actions in state policies.

# 4

# Conclusion

Public health surveillance is crucial to tackling infectious diseases; more so during outbreaks, such as the drawn-out COVID-19 pandemic—officially declared in early 2020 and, at the time of writing this report, still continuing to come in waves. The system's response strategy begins with early detection and containment, and proceeds to tackling the spread at the earliest. In the longer run, the response requires science-informed policy decisions that will enhance capacities and delay the spread of the contagion, in order to allow available infrastructure some space to breathe. Existing systems and resources are then able to combat the pandemic, and the adverse impacts on the population can be minimised.

Despite India's notably successful combat against the pandemic's first wave, the nation faced a massive challenge during the second wave in April 2021, with its poor data-led decisions, limited resources, and the inability to mobilise them in time. For example, absent timely data and with the existing architecture being deficient, there was little knowledge of the true burden of disease, especially NCDs, resulting in a misdirected approach to prioritising vulnerable populations.[1] This is not to say that India's states and union territories did not exert any effort to expand their infrastructural capacities and nudge public communication for awareness towards pandemic-appropriate behaviour. However, the requirements of India's massive population overwhelmed its health systems.

To be sure, *better infrastructure* does indicate *better preparedness* for an emergency; yet it is not the sole determinant. ORF's Health Systems Resilience Index tabulated the capacities of the country's states and UTs in health crisis management, using various indicators, among them: medical infrastructure; pre-pandemic morbidities; technological response; and information dissemination. As expansive as these parameters may be, however, they would still not be sufficient to gauge the on-ground realities that determine the degree of success, if any, of that state or UT in tackling the pandemic. Among these are the socio-economic inequities within the population that can determine who gets access to a health commodity even if, theoretically, it is available for all.

While the study has included certain appropriate spatial and gender equity indicators in an attempt to measure access to healthcare among the states' and UTs' most vulnerable populations, these parameters succeed only to a limited extent. Moreover, the available state-level data could not accurately capture the matter of policy stringency for the enforcement of COVID-19 appropriate behaviour.

A particularly important data limitation is the sheer absence of data in the public domain. In fact, several processes and statistics that ought to be duly recorded internally within the system may not be documented in a processable format or made available in open access at all. This undermines the effort to arrive at the truest potential scores. For several indicators, the available information on public services was limited to delivery in government institutions; a large portion of data, which is from the private sector, is missing.

Even with these limitations, however, this entire exercise—of recording each state and union territory's performance in five sets of health and pandemic-related parameters, and thereafter developing a composite index for resilience—still qualifies as a unique contribution to scholarship on the state of India's health systems. Previously acclaimed indices such as the Global Heath Security Index and WHO's Joint External Evaluation, both of which assess preparedness, have failed in predicting crisis response; their allotted rankings remarkably did not match COVID-19 outcomes.[2,3] The scope of traditional indices have restrained them from incorporating unpredictable shocks and measuring non-quantifiable indicators such as social solidarity.

Therefore, one learning that emerged out of this study is that while accurate and timely data is essential, the local, complex socio-political influences are crucial considerations in any attempt to understand a state's public health response. The varied COVID-19 experiences across the states and union

territories make it clear that mere quantifiable metrics, or conventional notions of preparedness limited to technical and physical infrastructure, could still result in an incapacitated response. As Mahajan (2021) observes, these assessments encourage their subjects to build the same infrastructure that are being measured, to begin with.

This report, therefore, is an attempt to emphasise the imperative of having the right physical and technical resources in place to combat a massive crisis such as the COVID-19 pandemic, but not without a localised scheme of crisis response. The novel coronavirus has revealed the failings of health systems and economies across the world, in largely comparable measures. Unless all nations succeed in defeating the pandemic, populations will remain vulnerable; some, more than others. As WHO warns of a future of antigenetically distinct variants of this virus and prolonged recovery periods—clinical care, public health intelligence, community dialogue and counter-measures need to adapt and remain standing.

For a developing country such as India, with a population that is enormous in size and highly heterogeneous, it is important to build adequate infrastructure and develop capacity utilisation that can make a huge impact on efforts to tackle a pandemic.

*For crisis response to be effective, policymakers need to pay particular attention to domestic investments and services, which continue to lag behind. Across India's states and union territories, therefore, there is a dire need for inter-sectoral, evidence-based response translating into knowledge-sharing practices and adaptive governance.*

1 Rukmini S., *Whole Numbers and Half Truths* (New Delhi: Westland Publications, 2021), pp 268

2 Enoch J Abbey et. all, "The Global Health Security Index is not predictive of coronavirus pandemic responses among Organization for Economic Cooperation and Development countries", *PloS One*, 15(10), (2020), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7540886/

3 Manjari Mahajan, "Casualties of Preparedness: The Global Health Security Index and COVID-19", *International Journal of Law in Context*, 17, no. 2 (2021): 204–14. doi:10.1017/S1744552321000288

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# Annexure

# ANNEXURE I:

## TABLE A1: DATA SOURCES & LIMITATIONS FOR STATE/UT PROFILES

| Category | Source | Limitations | Data Collected As Of/ Applicable For |
|---|---|---|---|
| **GENERAL HEALTH PROFILE** | | | |
| Population | Population Projection for India and the States: Report of the Technical Group on Population Projections (2019) | Available only for bigger states; Computed for smaller states | 2021 |
| Age-wise Composition of Population | | | 2021 |
| Households with any usual member covered under a health insurance/ financing scheme | National Family Health Survey 5 | | 2019-21 |
| Children age 12-23 months fully vaccinated based on information from either vaccination cared or mother's recall | National Family Health Survey 5 | | 2019-21 |
| Monthly per capita Out-of-pocket Expenditure in Health as a share of Monthly Expenditure | SDG 3 (Good Health and Well-being) Index 2020, NITI Aayog | Data for Sikkim is not available | 2020 |
| Revenue expenditure on Medical & Public Health and Family Welfare 2020-21 BE | STATE FINANCES: A Study of Budgets (2020), Reserve Bank of India | Data for A&N Islands, Chandigarh, D&N Haveli, Daman & Diu and Lakshadweep not available | 2020 |
| SDG 3 (Good Health and Well-being) India Index | Sustainable Development Goals Index India, NITI Aayog | Data for A&N Islands, D&N Haveli, Daman & Diu, Lakshadweep, and Puducherry are not available | 2020 |
| Bare Necessities Index (BNI) | Economic Survey of India 2020-21, Ministry of Finance | Data for D&N Haveli, Daman & Diu, and Puducherry not available; | 2020 |
| Total Deaths per 100,000 population | Global Burden of Disease (2019) Study: India Compare | Data of smaller UTs are clubbed together with a single value; J&K and Ladakh are reported together | 2019 |
| Top Causes of Mortality | | | 2019 |

| | | | |
|---|---|---|---|
| **MEDICAL INFRASTRUCTURE** | | | |
| Doctors, Nurses and Midwives | SDG 3 (Good Health & Well-being) Index 2020, NITI Aayog | Data for A&N Islands, D&N Haveli, Daman & Diu, Lakshadweep, and Puducherry are not available | 2020 |
| Registered Pharmacists | National Health Profile 2020 | Data for A&N, Ladakh, J&K, and Lakshadweep are not available | August 2020 |
| Covid-19 Sample Collection Centres | ICMR | | August-September 2021 |
| Covid-19 Testing Laboratories | ICMR | | August-September 2021 |
| Covid-19 Vaccination Sites | CoWIN Dashboard | | September-October 2021 |
| Dedicated Covid-19<br>• Hospitals (DCH)<br>• Health Centres (DCHC)<br>• Care Centres (DCCC) | Lok Sabha Unstarred Question no. 952 (answered on 18th September, 2020), Ministry of Health & Family Welfare | | September 2020 |
| Dedicated Covid-19 Beds | State NHM/HFWD/ Covid-19 Dashboards | | August-September 2021 |
| Blood Banks | Lok Sabha Starred Question no. 173, Ministry of Health & Family Welfare | Data for Ladakh is not available | 2021 |
| Ventilators | Rajya Sabha Unstarred Question no. 2518 (answered on 10th August, 2021), Ministry of Health & Family Welfare | Only Government sources; Private sector data is not recorded centrally | August 2021 |
| **TECH RESPONSE** | | | |
| Number of Mobile Connections | SDG 9 (Industry, Innovation & Infrastructure) India Index 2020, NITI Aayog | Data for A&N Islands, D&N Haveli, Daman & Diu, Lakshadweep, and Puducherry are not available | 2020 |
| Number of Internet Subscribers | SDG 9 (Industry, Innovation & Infrastructure) India Index 2020, NITI Aayog | Data for A&N Islands, D&N Haveli, Daman & Diu, Lakshadweep, and Puducherry are not available | 2020 |
| Government and NPO Initiatives | Mainstream Media | | 2020-2021 |
| **GOVERNMENT INVESTMENTS IN HEALTH** | | | |
| Budget Highlights 2021-22 BE | Respective State government website and Mainstream media | | February 2021 and later |
| **COVID-19 DATA** | | | |
| Cases, Deaths, Tests, Vaccinations | www.covid19india.org / www.covid19bharat.org | | Till 30th November 2021, and, 15th December 2021 (for deaths only) |

# ANNEXURE II

## ANALYTICAL FRAMEWORK, METHODOLOGY AND DATA SOURCES FOR INDEXATION

### a. Framework

The analytical framework of the study builds upon the development of the Health Systems Resilience Index across the 36 states and union territories. For this purpose, the quantified/ quantitative indicators reflecting each broad parameter/ sub-index under consideration are taken, and their respective weights in the context of the concerned sub-index are determined by principal component analysis. For this purpose, it is first necessary to apply transformation functions to the raw data. Subsequently, statistically computed weights and transformed indicator values are aggregated using the additive function to obtain the sub-index scores. Ghosh, et al (2014) suggest using Principal Component Analysis (PCA) for weight distribution since it stands out as one of the best practices globally, to enhance statistical robustness in assigning weights. Following this method, weights are attached to different indicators without exposing them to 'subjectivity' and 'sub-optimal representation'.

In the second round, using the sub-indices scores for all 36 states/UTs and weights assigned using informed arbitrariness, the composite scores for respective states have been arrived at. Assignment of weights for each sub-index has been driven by the objectives of our investigation- to simultaneously assess a state/UT's performance in terms of capacity building and capacity utilisation. Equal weight has been given to the domains capturing existing/additional resource bases and capacities, and the outcomes achieved through mobilising these resources.

At the first stage, the construction of the weighted sub-indices can, therefore, be represented by the following identity:

$$SI_{ij} = \sum_{k} w_{ki} . X_{kij} \quad ----(1)$$

Where,

$SI_{ij}$ *is the score of the* $i^{th}$ *sub − index for the* $j^{th}$ *state/UT*

$w_{ki}$ *is the weight of the* $k^{th}$ *component indicator of the* $i^{th}$ *sub − index obtained through principal component analysis over all indicators under this sub − index*

$X_{kij}$ *is the normalised score of the* $k^{th}$ *component indicator of the* $i^{th}$ *sub − index for the* $j^{th}$ *state/UT*

In the next stage, using the respective sub-index scores, the Health Systems Resilience Index for each State/UT is estimated based on the following identity:

$$I_j = \sum_i w_i . SI_{ij} \qquad ----(2)$$

Where,

$I_j$ *is the composite score for the* $j^{th}$ *state/UT*

$w_i$ *is the weight of the* $i^{th}$ $sub-$
*index obtained through principal component analysis over all* $sub-$ *index scores*

$SI_{ij}$ *is the score of the* $i^{th}$ $sub-$ *index for the* $j^{th}$ *state/UT*

The states/UTs are then ranked based on their respective scores pertaining to each broad parameter/ sub-index as well as the comprehensive Health Systems Resilience Index, to assess their relative performance. Besides, a subsequent analysis between the states and the union territories, on the basis of their average performance, is carried out using a mean-difference test.

**b. Indicators**

For the purpose of computation of the proposed index, 33 component indicators were identified and grouped into 5 broad parameters (sub-index), namely, general health profile (4), medical infrastructure (11), technology infrastructure (3), institutional support (4) and COVID-19-related health outcomes (11). The latest available data for each variable were collected for each of the 20 large states, 8 small states and 8 union territories. Table A2 summarises the chosen indicators under each sub-index and the sources of data.

## TABLE A2: INDICATORS OF HEALTH SYSTEMS RESILIENCE

| Sub-Index | Indicator | Data Source |
|---|---|---|
| 1. General Health Profile | 1.1. Households with any usual member covered under a health insurance/financing scheme (%)[1] | NFHS 5 (2019) |
| | 1.2. Children age 12-23 months fully vaccinated based on information from either vaccination card or mother's recall (%)[2] | NFHS 5 (2019) |
| | 1.3. Monthly per capita out-of-pocket expenditure on health as a share of Monthly Per capita Consumption Expenditure (%)[3],[4],[5] | SDG INDEX 2020, NITI Aayog, Government of India |
| | 1.4. Prevalence of NCDs per 100,000 population[6],[7] | Global Burden of Disease Study - India Compare (2019) |
| 2. Medical Infrastructure | 2.1. No. of Physicians, Nurses, midwives per 10,000 population[8] | SDG 3 Index 2020, NITI Aayog, Government of India |
| | 2.2. Registered Pharmacists in the State per 10,000 population[9] | National Health Profile 2020 |
| | 2.3. COVID-19 Testing Labs per 10,000 population[10] | |
| | 2.4. COVID-19 Sample Collection Centres per 10,000 population[11] | ICMR, dated: 18th August 2021 |
| | 2.5. Covid Beds per 10,000 population[12],[13] | Various sources include state NHM/HFWD/COVID-19 Dashboards, dated: August 2021 |
| | 2.6. Dedicated Covid Hospitals (DCHs) per 10,000 population | Lok Sabha unstarred question no. 952, dated: 16th September 2020 |
| | 2.7. Dedicated Covid Health Centre (DCHC) per 10,000 population | Lok Sabha unstarred question no. 952, dated: 16th September 2020 |
| | 2.8. Dedicated Covid Care Centre (CCC) per 10,000 population | Lok Sabha unstarred question no. 952, dated: 16th September 2020 |
| | 2.9. Vaccination Sites per 10,000 population[14] | CoWIN DASHBOARD |
| | 2.10. No. of Ventilators per 10,000 population[15] | Rajya Sabha unstarred question no. 2518, dated: 5th August 2021 |
| | 2.11. No. of blood banks per 10,000 population[16],[17] | Lok Sabha starred question no. 173, dated: 30th July 2021. |

| | | |
|---|---|---|
| 3. Technology Infrastructure | 3.1. No. of mobile connections per 100 people[18] | SDG Index 2020, NITI Aayog, Government of India |
| | 3.2. No. of Internet Subscribers per 100 people[19] | SDG Index 2020, NITI Aayog, Government of India |
| | 3.3. Data Reporting Scores[20],[21],[22] | Various State Government Portals/Dashboards |
| 4. Institutional Support[23].[24] | 4.1. Revenue Expenditure (2. Medical and Public Health) per 10,000 population[25] | State Finances: Study of Budgets (2020), Reserve Bank of India |
| | 4.2. Revenue Expenditure (3. Family Welfare) per 10,000 population[26],[27] | State Finances: Study of Budgets (2020), Reserve Bank of India |
| | 4.3. Percentage change in revenue expenditure on health in 2020-21(RE) over 2019-20 (RE)[28] | State Finances: Study of Budgets (2020), Reserve Bank of India |
| | 4.4. Percentage change in revenue expenditure on health in 2021-22(BE) over 2019-20 (RE)[29],[30] | State Finances: Study of Budgets (2020), Reserve Bank of India |
| 5. COVID-19-related Health Outcomes | 5.1. Vaccine Doses per 100,000 population[31] | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | 5.2. Tests per 100,000 population[32] | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | 5.3. Deaths per 100,000 population[33] | COVID19 BHARAT Dashboard, dated: 15th December 2021 |
| | 5.4. Cases per 100,000 population[34] | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | 5.5. Peak daily caseload per 100,000 population (7-day average)[35] | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | 5.6. Time taken between the highest peak of daily cases to its 20% (7-day average)[36] | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | 5.7. Time taken between peak positivity rate to fall below 5% (7-day average)[37] | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | 5.8. Distributional gap between highest and lowest vaccine coverage per 1000 population (district-wise)[38],[39],[40],[41] | CoWIN Dashboard, dated: 31st October 2021 |
| | 5.9. Days taken to reach benchmark vaccination coverage of 18+ population[42] | COVID19 BHARAT Dashboard, dated: 30th November 2021 |
| | 5.10. Weeks taken to reach benchmark vaccination coverage of 60+ population[43] | CoWIN Dashboard, dated: 30th November 2021 |
| | 5.11. Gender gap in vaccination coverage (female-to-male ratio) per 18+ 100,000 population[44] | CoWIN Dashboard, dated: 30th November 2021 |

**c. Removing Scale Bias, Normalisation and Complement of Negative Indicators**

The data collected across 36 Indian states and UTs, owing to the population size in most cases, has inherent scale biases. The variables have been converted into a per unit format (to remove the relevant scale bias). Further, all the data points were normalised by the following formula to range from 0 to 1 (unit free):

$$X_{kij} = \frac{x_{kij} - min_j(x_{kij})}{max_j(x_{kij}) - min_j(x_{kij})} \quad ----(3)$$

Where,

$X_{kij}$ *is the normalised score of the* $k^{th}$ *component indicator of the* $i^{th}$ *sub − index for the* $j^{th}$ *state/UT*

$x_{kij}$ *is the value of the* $k^{th}$ *component indicator of the* $i^{th}$ *sub − index for the* $j^{th}$ *state/UT*

$min_j(x_{kij})$ *is the minimum value of the row vector of* $x_{kij}$ *values across the States and UTs*

$max_j(x_{kij})$ *is the minimum value of the row vector of* $x_{kij}$ *values across the States and UTs*

For the negative indicators (for example, prevalence of NCDs), the complement of 1 for their respective normalised values has been taken, so as to convert them into a positive indicator. This has been done to form a uniform, unit and direction-free, composite preparedness index.

**d. Determination of Weights by Principal Component Analysis and Informed Arbitrariness (Nested Weights)**

In the first stage, calculation of weights for each indicator under a particular sub-index (or, parameter), for 36 observations have been conducted by Principal Component Analysis (PCA) to rank the states/UTs under each sub-index (See Annexure III Charts A1.1 – A5.3). This methodology has been chosen over a simple average technique to understand the dominant patterns in the dataset, in terms of weights that should be assigned to each parameter. With 'i' denoting sub-index (parameter), the 5 sub-indices are defined by the closed set, i = [1, 5]. At the same time, k denoting a component indicator, the indicators are determined by the closed set k = [1, 33].

Now let us define the weight attached, by PCA, to an indicator 'm' in sub-index 'n' as $w_{mn}$ where,

$$w_{mn} = [max\{comp1, \dots, compm\}]^2 * explanatory\ power\ of\ [max\{comp1, \dots, compm\}].$$

Each of the weights under a particular sub-index has been scaled, to sum up to 1 (100%) in order to avoid under-representation.[46,47,48] Finally, we get the state/UT and sub-index-wise scores as given in (1).

## FIGURE A1: WEIGHTS ASSIGNED TO COMPONENT INDICATORS USING PRINCIPAL COMPONENT ANALYSIS

| General Health Profile | Medical Infrastructure | Technology Infrastructure | Institutional Support | Covid-19 related Health Outcomes |
|---|---|---|---|---|
| • Health Insurance coverage (17 %)<br>• Fully vaccinated children in the state (30 %)<br>• Monthly per capita out-of-pocket expenditure as a share of per capita Consumption Expenditure (45%)<br>• Prevalence of NCDs –Diabetes & Kidney Diseases, Neoplasms (Cancer), Respiratory Infections & TB, Cardiovascular Diseases (8 %) | • No. of Physicians/ Nurses/Midwives (7 % )<br>• Registered Pharmacists (10 %)<br>• Covid-19 Sample Collection Centres (9 %)<br>• Covid-19 Testing Labs (12 %)<br>• Dedicated Covid-19 Beds (6 %)<br>• Dedicated Covid-19 Hospital (9 %)<br>• Dedicated Covid-19 Health Centres (12 %)<br>• Dedicated Covid-19 Care Centres (10 % )<br>• Covid-19 Vaccination sites (4 %)<br>• No. of ventilators (11 %)<br>• No. of blood banks (10 %) | • No. of Mobile Connections (32 %)<br>• No. of Internet Subscribers (33 %)<br>• Data Reporting & Granularity (35 %) | • Revenue Expenditure ( Medical and Public Health) per 10,000 population (RE 2020-21) (24 %)<br>• Revenue Expenditure ( Family Welfare) per 10,000 population (RE 2020-21) (25 %)<br>• % Change in revenue expenditure on health in 2020-21(RE) over 2019-20 (RE) (26 %)<br>• % Change in revenue expenditure on health in 2021-22(BE) over 2019-20 (RE) (25 %) | • Vaccine doses administered (11 %)<br>• Tests conducted (11 %)<br>• Reported Cases (1 %)<br>• Reported Deaths (4 %)<br>• Peak daily caseload per 100,000 population (7-day avg.) (3 %)<br>• Days taken between the highest peak of daily cases to its 20% (7-day avg.) (14 %)<br>• Time taken between peak positivity rate to fall below 5% (7-day avg.) (14 %)<br>• GAP between highest and lowest district-wise vaccine coverage per 1000 population (7 %)<br>• Days taken to reach benchmark vaccination coverage of 18+ population (13%)<br>• Weeks taken to reach benchmark vaccination coverage of 60+ population (13%)<br>• Gender Gap in Vaccine coverage (Female-to-male ratio) per 100.000 population (9%) |

Source: Authors' own

Next, the corresponding weight for each of the 5 sub-indices has been assigned using informed arbitrariness. Equal weight has been assigned to the existing/ additional resource base/ capacities captured through the general health profile, medical and technology infrastructure, as well as institutional support, and the outcomes achieved through mobilisation of these resources are reflected in the COVID-19-related health outcomes across the various states and UTs. Using the weights for each sub-index 'n', we calculate the composite Health Systems Resilience Index as defined in (2) to rank the states and union territories in terms of their preparedness (See Annexure III: Charts A6.1 – A6.3).

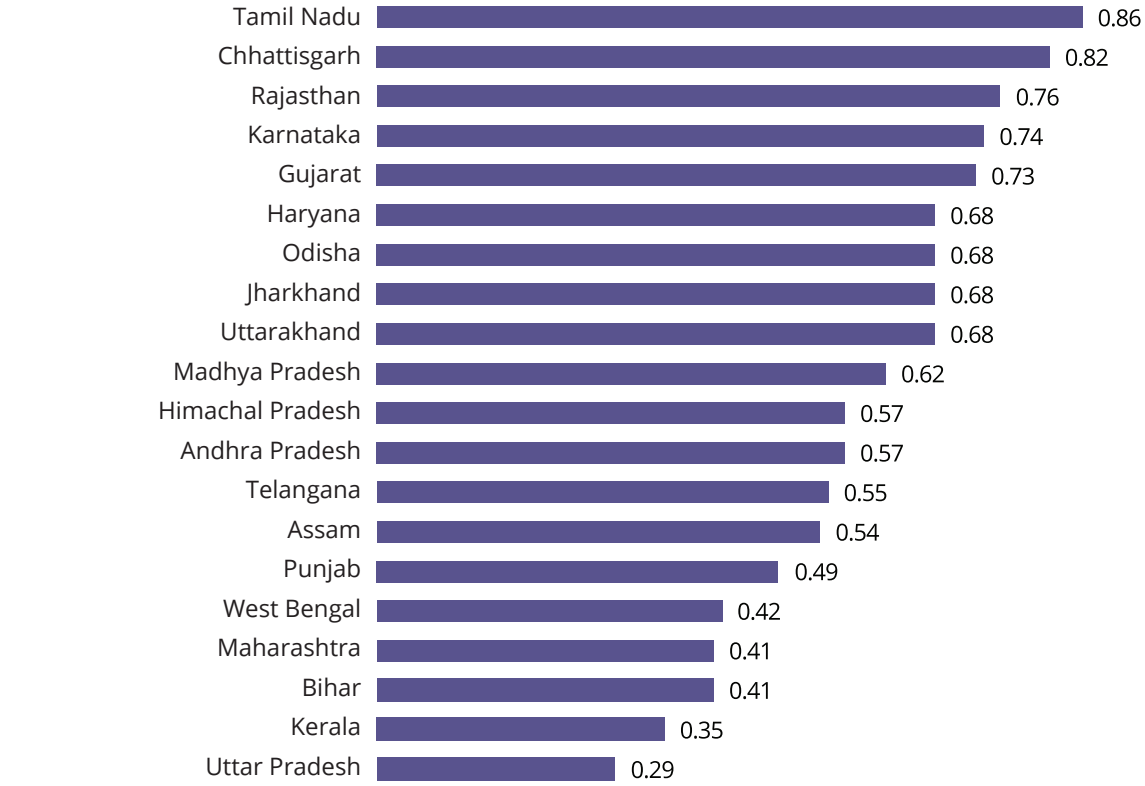
## FIGURE A2: WEIGHTS ASSIGNED TO COMPONENT SUB-INDICES USING INFORMED ARBITRARINESS

| Weights (Informed Arbitrariness) |
| --- |
| • General Health Profile (12.5 %)<br>• Medical Infrastructure (12.5 %)<br>• Technology Infrastructure (12.5 %)<br>• Institutional Support (12.5 %)<br>• COVID-19 related Health Outcomes (50 %) |

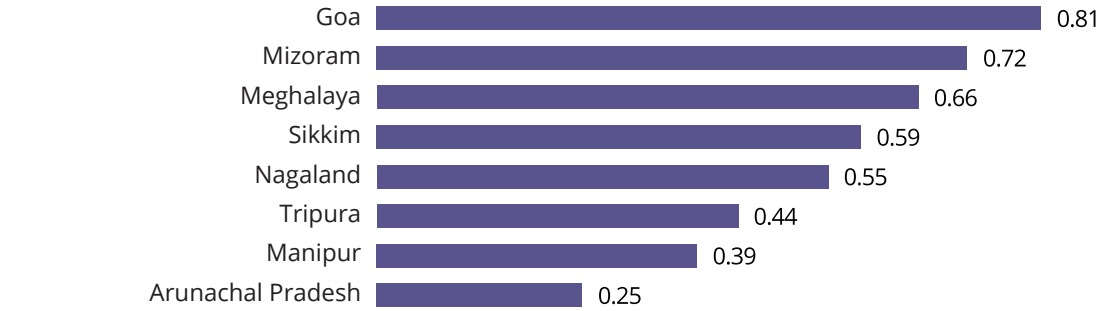
Source: Authors' own

# ANNEXURE III: INDEX SCORES FOR STATES AND UNION TERRITORIES

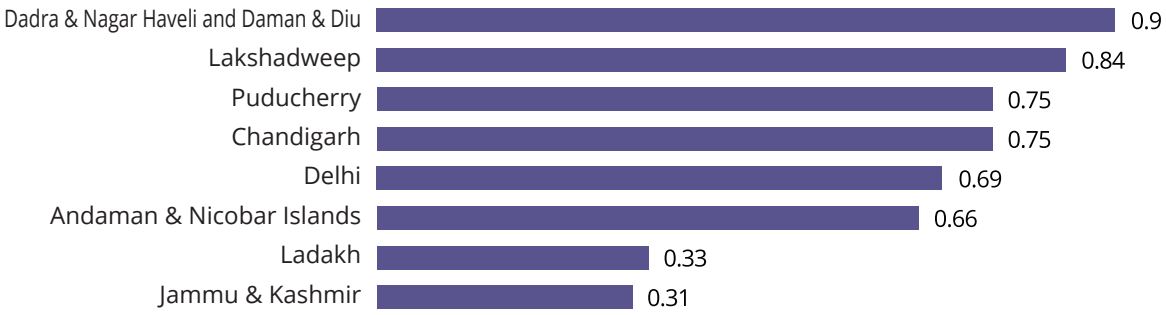
## CHART A1.1: GENERAL HEALTH PROFILE INDEX SCORES FOR LARGE STATES




## CHART A1.2: GENERAL HEALTH PROFILE SCORES INDEX FOR SMALL STATES

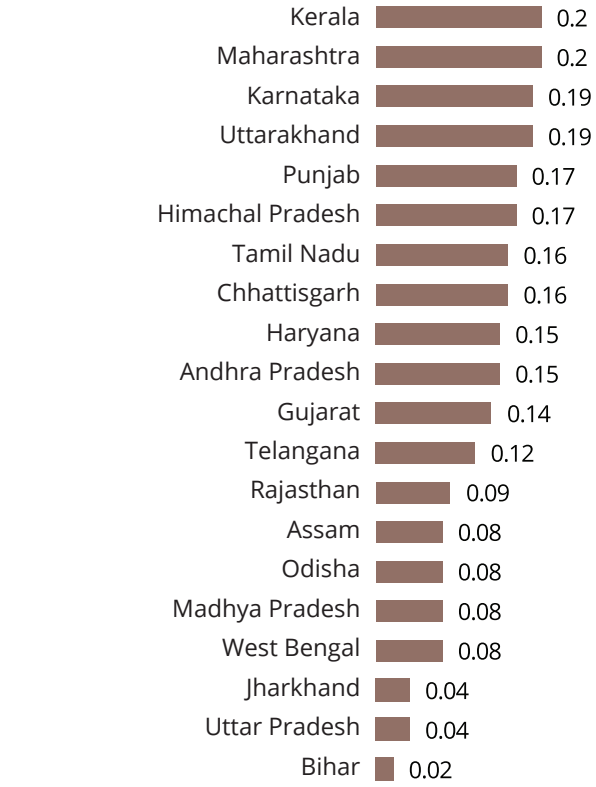



## CHART A1.3: GENERAL HEALTH PROFILE SCORES INDEX FOR UNION TERRITORIES

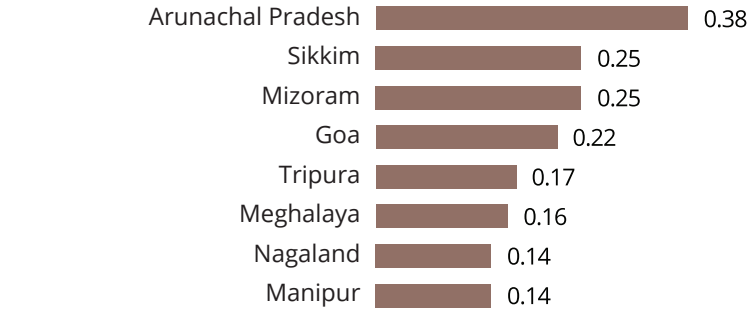



Source: Authors' own

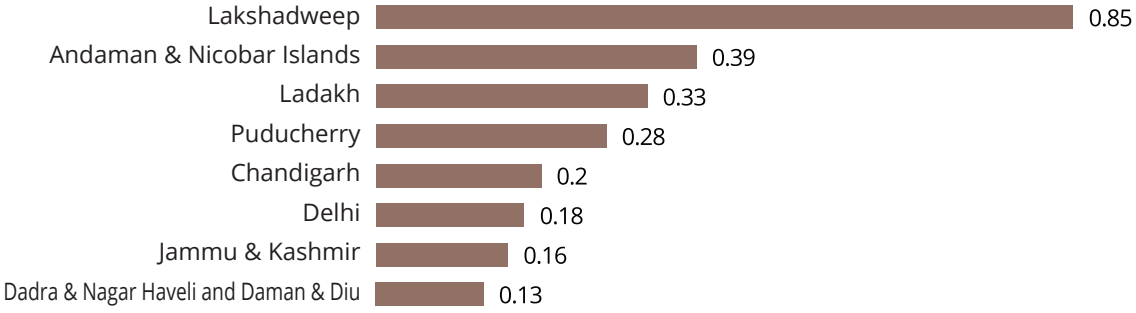
## CHART A2.1: MEDICAL INFRASTRUCTURE INDEX SCORES FOR LARGE STATES




## CHART A2.2: MEDICAL INFRASTRUCTURE INDEX SCORES FOR SMALL STATES

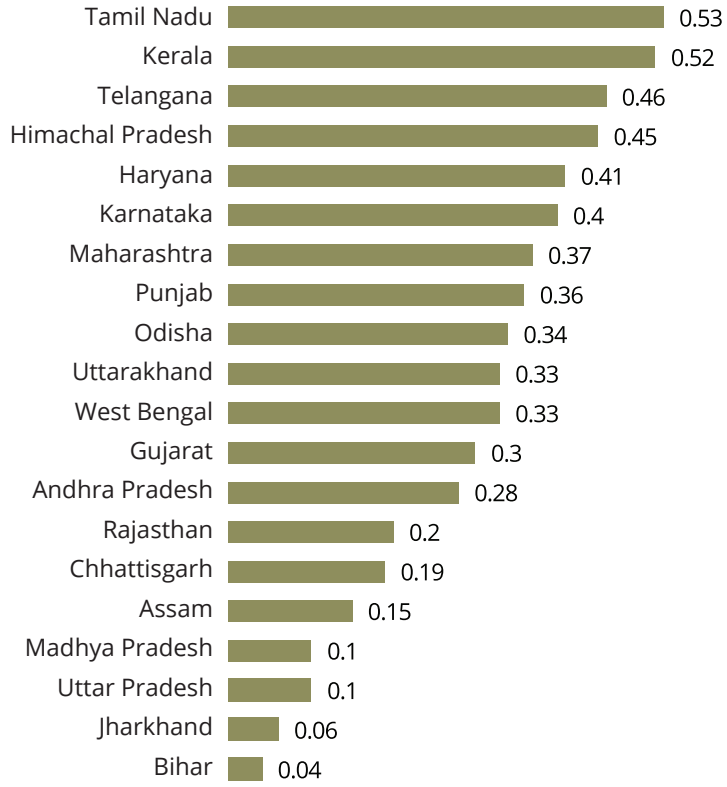



## CHART A2.3: MEDICAL INFRASTRUCTURE INDEX SCORES FOR UNION TERRITORIES

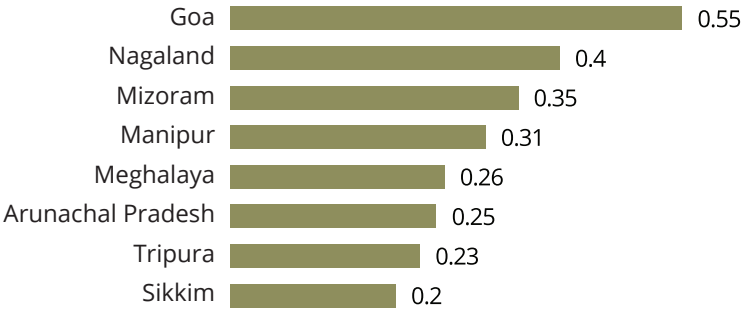



Source: Authors' own

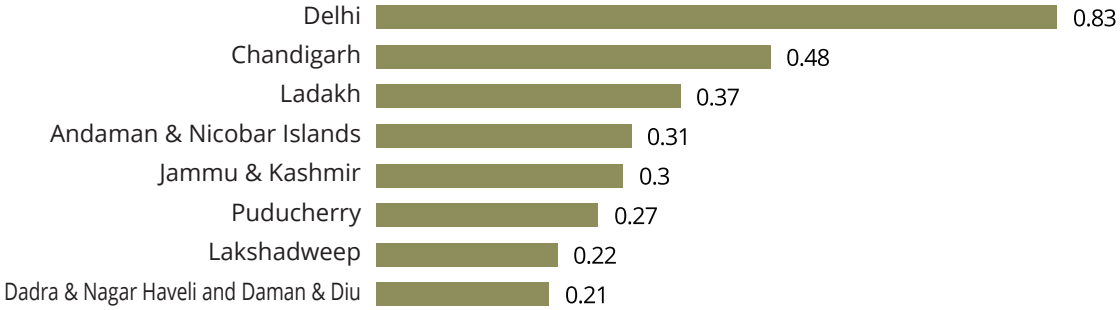
## CHART A3.1: TECHNOLOGY INFRASTRUCTURE INDEX SCORES FOR LARGE STATES




## CHART A3.2: TECHNOLOGY INFRASTRUCTURE INDEX SCORES FOR SMALL STATES

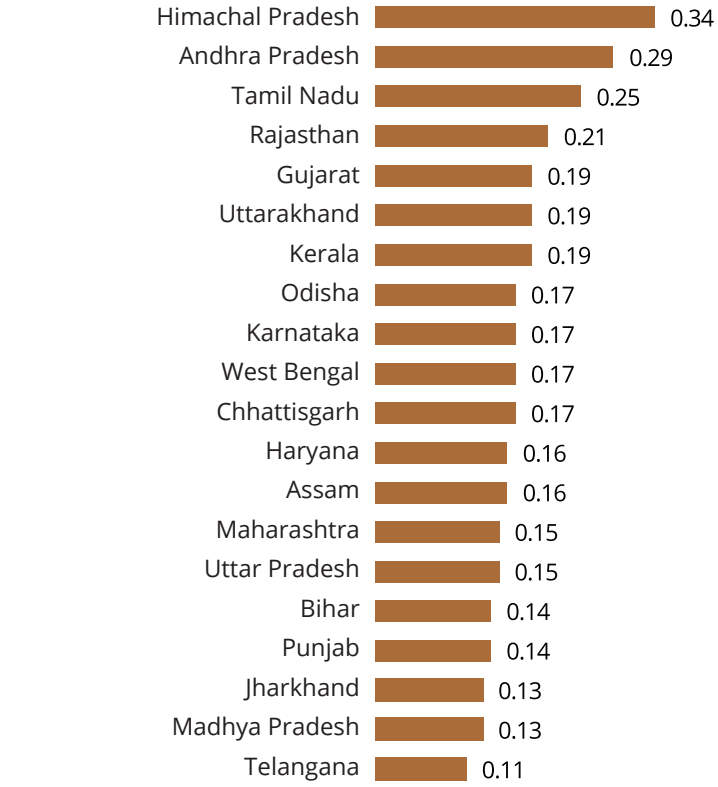



## CHART A3.3: TECHNOLOGY INFRASTRUCTURE INDEX SCORES FOR UNION TERRITORIES

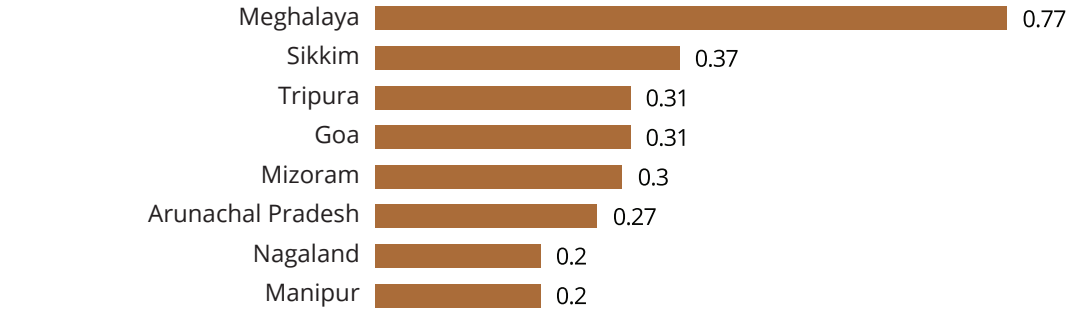



Source: Authors' own

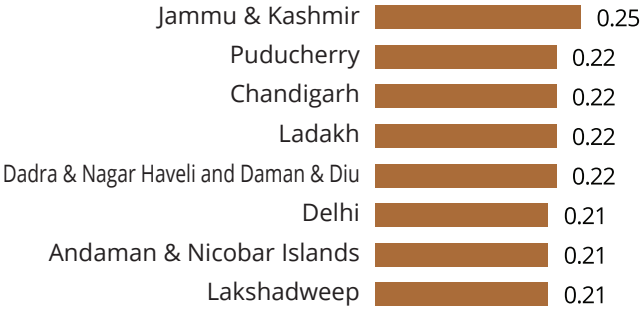
## CHART A4.1: INSTITUTIONAL SUPPORT INDEX SCORES FOR LARGE STATES




## CHART A4.2: INSTITUTIONAL SUPPORT INDEX SCORES FOR SMALL STATES

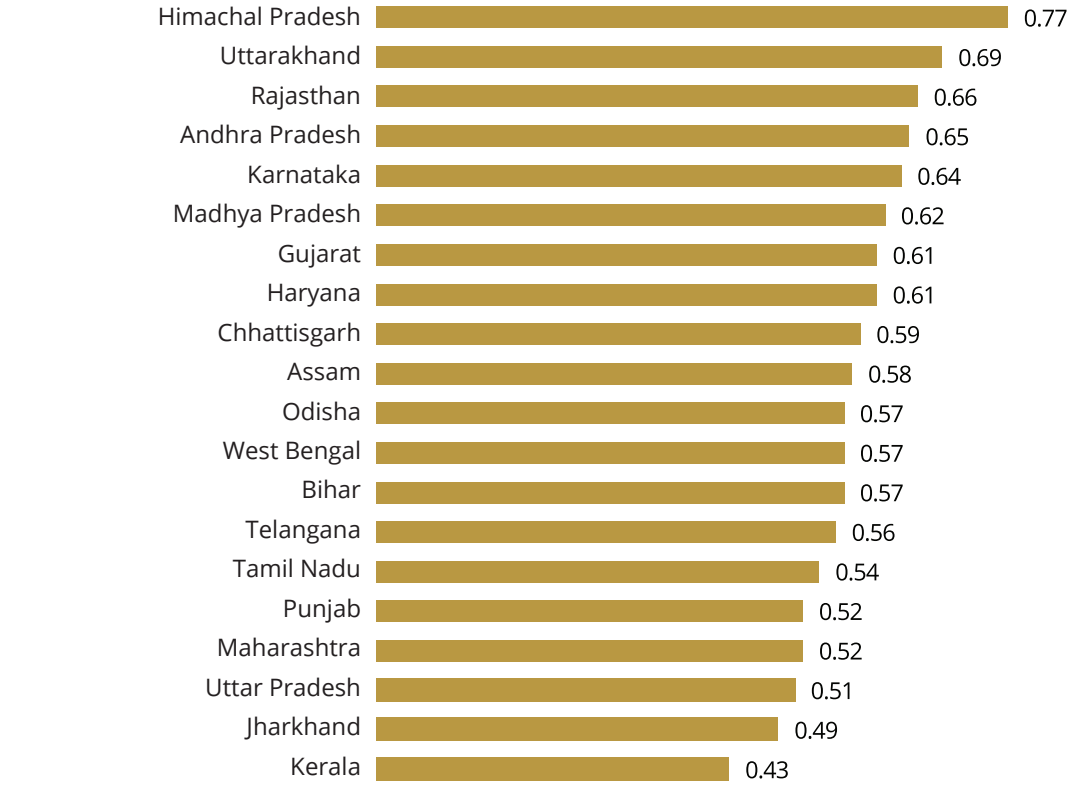



## CHART A4.3: INSTITUTIONAL SUPPORT INDEX SCORES FOR UNION TERRITORIES

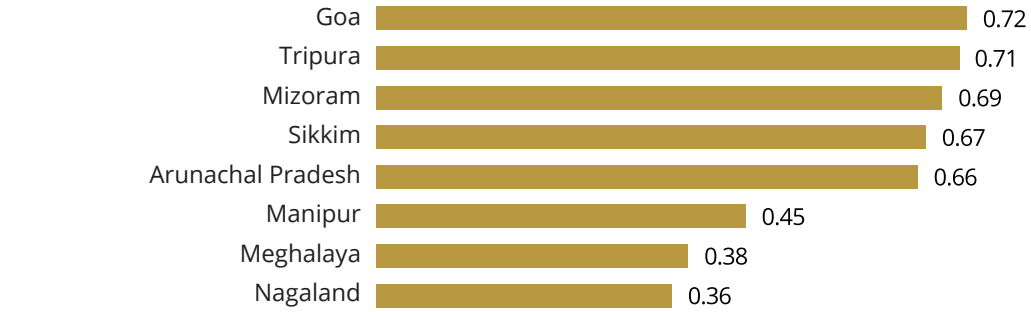



Source: Authors' own

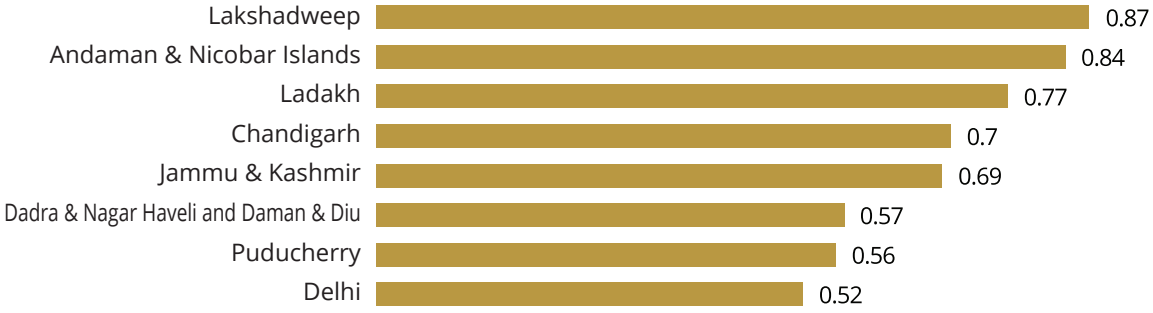
## CHART A5.1: COVID-19-RELATED HEALTH OUTCOMES INDEX SCORES FOR LARGE STATES




## CHART A5.2: COVID-19-RELATED HEALTH OUTCOMES INDEX SCORES FOR SMALL STATES

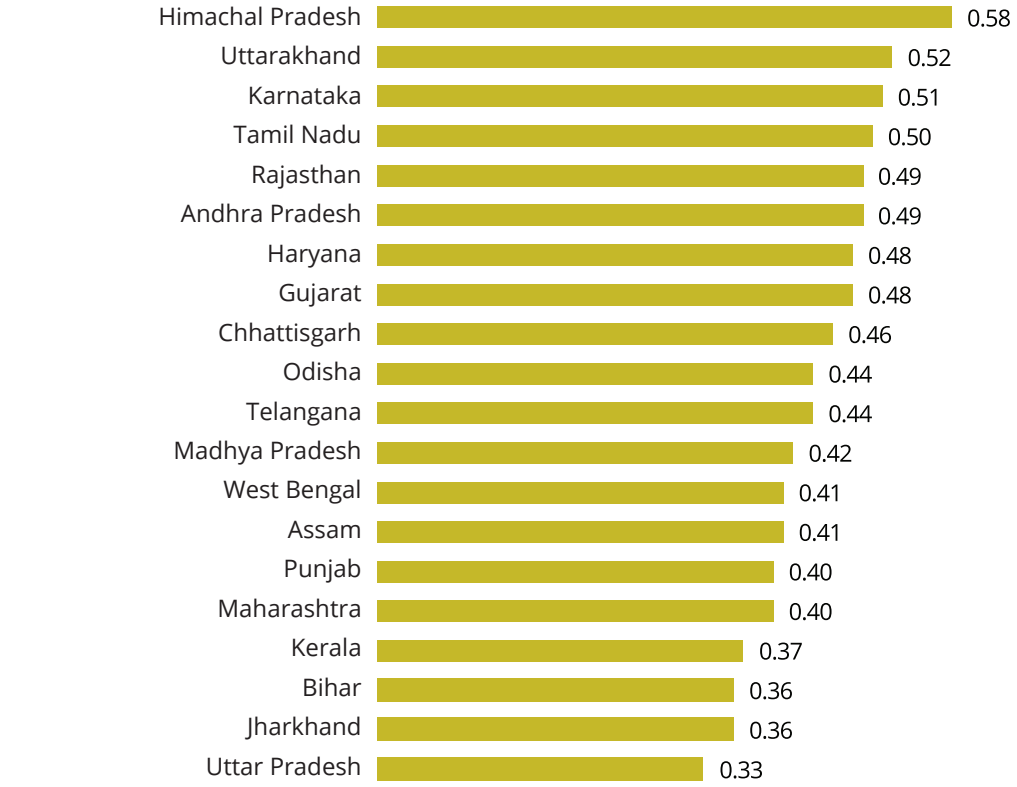



## CHART A5.3: COVID-19-RELATED HEALTH OUTCOMES INDEX SCORES FOR UNION TERRITORIES



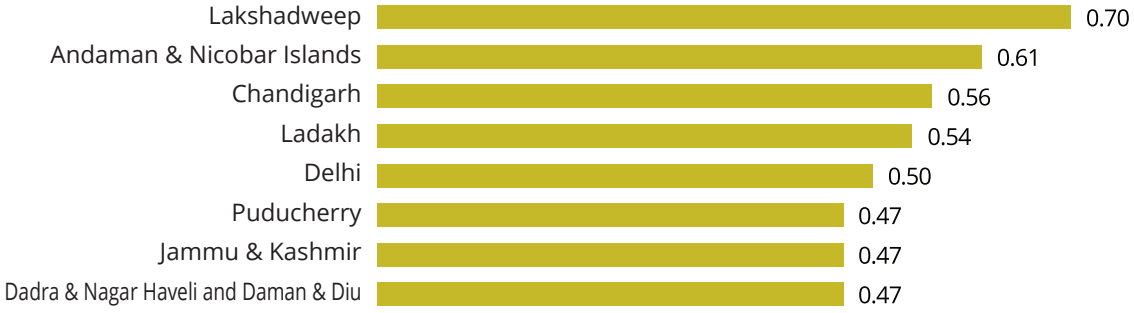

Source: Authors' own

## CHART A6.1: HEALTH SYSTEMS RESILIENCE INDEX SCORES FOR LARGE STATES




## CHART A6.2: HEALTH SYSTEMS RESILIENCE INDEX SCORES FOR SMALL STATES

## CHART A6.3: HEALTH SYSTEMS RESILIENCE INDEX SCORES FOR UNION TERRITORIES




Source: Authors' own

## ANNEXURE IV: COMPARISON BETWEEN AVERAGE PERFORMANCE OF STATES AND UNION TERRITORIES

### TABLE A3: RESULTS FOR MEAN-DIFFERENCE TEST (T-TEST) BETWEEN STATES AND UNION TERRITORIES

| t-test | Health Systems Resilience Index | |
|---|---|---|
| sample mean_Small states | m1 | 0.47 |
| sample mean_Large states | m2 | 0.44 |
| t-statistic | T | 1.03 |
| p-value | | 0.16 |
| Null hypothesis | m1 = m2 | There is no significant difference in the average performance of small states and large states |
| Alternate hypothesis | m1 > m2 | The average performance of small states is significantly better than the large states |
| Inference (at 5% significance level) | Null hypothesis cannot be rejected. | The difference in mean values is not statistically significant. |

### TABLE A4: RESULTS FOR MEAN-DIFFERENCE TEST (T-TEST) BETWEEN STATES AND UNION TERRITORIES

| t-test | Health Systems Resilience Index | |
|---|---|---|
| sample mean_UTs | m1 | 0.54 |
| sample mean_States | m2 | 0.45 |
| t-statistic | T | 3.11 |
| p-value | | 0.00 |
| Null hypothesis | m1 = m2 | There is no significant difference in the average performance of states, and UTs |
| Alternate hypothesis | m1 > m2 | The average performance of UTs is significantly better than the States |
| Inference (at 5% significance level) | Null hypothesis is rejected. | The difference in mean values is statistically significant at a 1% level of significance. |

## ANNEXURE V: PER CAPITA NSDP AND HEALTH SYSTEMS RESILIENCE OF THE STATES AND UTS

### TABLE A5: RESULTS FOR CORRELATION (F-TEST) BETWEEN PER CAPITA NSDP AND HEALTH SYSTEMS RESILIENCE INDEX[49]

| Variables | X | Per Capita Net State Domestic Product |
|---|---|---|
| | Y | Health Systems Resilience Index |
| Correlation Coeffecient | R | 0.63 |
| R-squared | R2 | 0.40 |
| p-value | | 0.00 |
| Null hypothesis | R = 0 | X and Y are uncorrelated |
| Alternate hypothesis | R ≠ 0 | X and Y are correlated |
| Inference (at 1% significance level) | Null hypothesis is rejected. | The correlation between X and Y is statistically significant at 1% level of significance. |

[1] The actual values were expressed in percentage (%), normalized on a scale of 0 to 1.

[2] The actual values were expressed in percentage (%), normalized on a scale of 0 to 1.

[3] Only upward deviations from the threshold value of 10% monthly per capita out-of-pocket health expenditure as a share of per capita consumption expenditure have been considered as an indicator of household financial stress. All negative deviations have been set to 0.

[4] For Sikkim, the missing data has been substituted using the average value for the North-East region.

[5] The deviation values were expressed in percentage (%), normalized on a scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

[6] For the indicator (or, variable) prevalence of non-communicable diseases (NCDs), four most common diseases, namely, diabetes and kidney diseases, neoplasm, respiratory infection and TB and cardiovascular diseases, were identified and their respective normalised scores were added up to arrive at the final figures for the indicator. The normalised values have been subtracted from 1 to convert into its complement.

[7] Data for J&K and Ladakh are reported together; the study reports a category of "Other Union Territories", whose value has been used for D&D and D&NH, Andaman & Nicobar, Chandigarh, Puducherry and Lakshadweep.

[8] The original values were normalized on a scale of 0 to 1. In case of missing data for Andaman & Nicobar Islands, Lakshadweep, Puducherry and Daman& Diu and Dadra & Nagar Haveli, corresponding regional averages have been used as substitutes.

[9] The original values were normalized on a scale of 0 to 1. In case of missing data for Jammu & Kashmir, Ladakh, Andaman & Nicobar Islands and Lakshadweep, corresponding regional averages have been used as substitutes.

[10] The data includes both government and private institutions. The original values were normalized on a scale of 0 to 1.

[11] The data includes both government and private institutions. The original values were normalized on a scale of 0 to 1.

[12] Numbers of beds imply total number of Isolation beds, Oxygen beds and ICU beds. The original values were normalized on a scale of 0 to 1.

[13] In case of missing data for Jammu & Kashmir, Sikkim and Lakshadweep, corresponding regional averages have been used as substitutes.

[14] The data includes both government and private institutions. The original values were normalized on a scale of 0 to 1.

[15] Only government data, private data is not recorded centrally. The original values were normalized on a scale of 0 to 1.

[16] The original values were normalized on a scale of 0 to 1.

[17] In case of missing data for Ladakh, corresponding regional average has been used as a substitute.

[18] The original values were normalized on a scale of 0 to 1.

[19] In case of missing data for Chandigarh, Andaman & Nicobar Islands, Lakshadweep, Puducherry and

Daman& Diu and Dadra & Nagar Haveli, corresponding regional averages have been used as substitutes. The original values were normalized on a scale of 0 to 1.

20 This is based on composite scoring of data availability, accessibility and granularity across state portals and social media, relating to COVID-19 and includes variables such as:

Gender and age segregated data reporting for COVID-19 related cases and deaths. Chandigarh, Manipur, Karnataka (Deaths), Tamil Nadu (Deaths) report gender-segregated data in daily bulletins only. Split in cumulative cases wasn't found.

Dedicated COVID-19 Website reporting real-time (updated every 24-48 hours) and historical (at least past 1 month data is easily accessible to public use) data.

Real-time data for Beds/Hospitals implies updated within the past 7 days.

Social Media platforms have been verified to update at least every 24 hours with COVID-19 update.

Availability of state bulletins in English language.

21 For qualitative indicators pertaining to data reporting scores, 0-1 dummy variables were used for scoring and aggregated to arrive at a total score for each state/UT, to be utilised in subsequent stages of computation.

22 For Andhra Pradesh, finer details on data segregation could not be studied as the bulletins are in Telugu only. The score used here have been taken from a previous study available at: https://github.com/varun-vasudevan/CDRS-India/blob/master/study3_june_2021/surveillance_reporting.csv#L29(updated June 2021).

23 In case of missing data for Chandigarh, Ladakh, Andaman & Nicobar Islands, Lakshadweep, Daman& Diu and Dadra & Nagar Haveli, corresponding regional averages have been used as substitutes. The final scores were normalized on a scale of 0 to 1.

24 The Ayushman Bharat- PMJAY scheme covering upto INR 5 lakhs of medical costs of treatment as Insurance was considered to be a good indicator of State Government's response to COVID-19. But the data on the percentage coverage of the COVID-19 claims issued w.r.t. the claims filed was unavailable in the public domain. While attempts were made to procure this data from the authorities, it wasn't collected centrally.

25 The original values were normalized on a scale of 0 to 1.

26 Two separate indicators have been considered to account for revenue expenditure in the health sector – current provisioning and future potential. Expenditure on family health and welfare, in addition to targeted provision of maternity and child healthcare services, includes expenditure on mass education, research and evaluation of the existing structure which bear implications for the future potential of the system.

27 The original values were normalized on a scale of 0 to 1.

28 The original values were normalized on a scale of 0 to 1.

29 The percentage change in revenue expenditure on health for 2021-2022(BE) has been calculated considering 2019-20 as the base year for a comparison to the "business as usual" scenario.

30 The original values were normalized on a scale of 0 to 1.

31 The original values were normalized on a scale of 0 to 1.

32 The original values were normalized on a scale of 0 to 1.

33 For the indicator on COVID-19-related deaths, a later cut-off date has been referred to account for backlogs in the number of deaths reported at any given time. The original values were normalized on a

scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

34 The original values were normalized on a scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

35 The original values were normalized on a scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

36 The original values were normalized on a scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

37 For states/UTs like Dadra & Nagar Haveli and Daman & Diu, Telangana, Lakshadweep, Mizoram, Ladakh and Delhi consistent time series data on testing/positivity rate were not available. Hence, corresponding missing values were substituted with regional averages. The original values were normalized on a scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

38 Total district-wise vaccination doses were used to calculate corresponding vaccination coverage of eligible population (18+ years population) for each district, using population estimates from the Periodic Labour Force Survey (PLFS) (2017-18).

39 For some newly formed districts/otherwise cases where PLFS population figures were not available, district level 18+ population was estimated using average regional population density and total area covered by the district (sourced from various district administration websites).

Exceptions: a) For Delhi, average population density across all districts is used for estimation of eligible population for districts with missing values.

b) For Noney district in Manipur, the total population figure available at https://geoiq.io/places/Noney/SiuzoWJoO1 was used for estimation of eligible population.

40 For distributional gap estimation, the range between the best and the worst performing district in each state with respect to vaccination coverage has been calculated. Standard deviation has not been used since it measures the disparity w.r.t. the mean performer and would, hence, iron out the absolute disparity, to some extent.

41 The original values were normalized on a scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

42 Jharkhand had the lowest vaccination coverage as of 30th November 2021, which has been considered as the benchmark for comparison. The original values were normalized on a scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

43 The indicator on vaccine coverage among 60+ populations has been included to separately account for access among priority groups. Jharkhand and Tamil Nadu had the lowest vaccination coverage as of the week of 30th November 2021, which has been considered as the benchmark for comparison. The original values were normalized on a scale of 0 to 1. The normalised values have been subtracted from 1 to convert into its complement.

44 The indicator on gender gap in vaccine coverage has been included to account for the already known barriers in accessing healthcare services  This is a sensitive indicator used to assess gendered access to healthcare services. The female-to-male ratio in vaccine coverage was normalized on a scale of 0 to 1. While the access to medical services is believed to be further disadvantageous for gender and sexual minorities such as the LGBTQ+ groups, lack of data is a pertinent limitation in studying it.

45 All computations have been done on STATA 14.0.

46 Under General Health Profile, the "Prevalence of NCDs" has been considered a relevant indicator- capturing the intrinsic risks of comorbidity associated with the population of a state. However, since it is not a direct policy tool at the hands of the states/UTs, it has a relatively lower weight (8%) compared to other relevant indicators considered under this domain.

47 Under Medical Infrastructure, the "Total number of vaccination sites" – while a relevant indicator of state capacity- does not capture complementary efforts of vaccinations such as door-to-door campaigns, temporary camps, etc. Accordingly, this indicator has a relatively low weight, i.e., 4%. However, the missing information in this regard has been somewhat captured through the indicators on vaccination coverage included under COVID-19-related Health Outcomes.

48 Under COVID-19-related Health Outcomes, both input (related to tests and vaccination) and output (related to direct health outcomes such as deaths, cases, rate of infection) variables have been considered.

The indicators on "Cumulative deaths", "Cumulative cases" and the "Peak caseload" have relatively low weights (4%, 1% and 3%, respectively) among the output variables – since, they are significantly sensitive to reporting. For example, the definition of COVID-19-related deaths varies considerably across states.

The two indicators "Days taken between the highest peak of daily cases to its 20%" and "Time taken between peak positivity rate to fall below 5%" capture a state's performance relative to its' own reporting. While these are partially correlated, they capture significant amount of unique information. For example, a state may bring down its daily number of cases faster simply by testing less (without any actual decrease), in which case the positivity rate will increase, or vice-versa. Hence, these two indicators have been considered as complementary sets of information, not substitutes.

49 Data on per capita Net State Domestic Products (current prices) (2018-19) has been sourced from National Statistical Office, Ministry of Statistics and Programme Implementation, Government of India. The union territories of Andaman & Nicobar, Dadra & Nagar Haveli and Daman & Diu, Lakshadweep, and Ladakh have not been considered for the calculation of correlation coefficient due to unavailability of corresponding NSDP figures.

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## Authors' Note

This project has been extremely challenging and yet a most enriching experience for the entire research team. The authors thank Dr. Samir Saran, President of ORF and Dr. Shamika Ravi, Vice President at ORF, for their valuable feedback which helped us complete this research and give the report its singular voice.

We also thank the anonymous reviewers of the report who provided valuable feedback on a previous draft of this report.

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