Assessing Healthcare Capacity in India

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Abstract

We assess India's healthcare capacity by comparing several countrywide and state-level metrics: per capita spending on healthcare, healthcare spending priority in budgets, hospital bed capacity, and capacity in terms of doctors, nurses, and total healthcare personnel. We find that, overall, India has very fragile healthcare infrastructure for dealing with the COVID-19 outbreak. We make three recommendations: (1) India's private-sector healthcare system has more capacity than government facilities, so the Indian government will need to rely on and incentivize the private sector by increasing funding and removing bottlenecks. (2) Healthcare capacity varies across states, and the union government should identify and assist at-risk states. (3) Compared to rural areas, urban areas are very poorly served by the state hospitals, creating an urgent need for state governments to identify and assist at-risk, high-density urban areas. In the absence of a vaccine, the lockdown may have to continue longer with measures such as a universal basic income implemented for the poor, allowing India to swiftly build up its healthcare infrastructure.

JEL codes: H51, H75, I11, I38

Keywords: COVID-19, coronavirus, coronavirus pandemic, India, India healthcare capacity, India COVID-19 preparedness, India COVID-19 lockdown, public health, economics, quarantine, economy, economic crisis.

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On March 24, 2020, Prime Minister Narendra Modi declared a country-wide lockdown in India for 21 days, locking in 1.35 billion people, a sixth of humanity, in the largest and longest such lockdown in history. This was in response to COVID-19 outbreaks in local communities in India, and known cases that are doubling every five days. Ray et al. (2020) predict that without any interventions, the number of cases in India by May 15 will be at 161 per 100,000 people—or a total of 2.2 million cases. If the most severe form of intervention is adopted for the whole period of the COVID-19 threat (similar to the current countrywide lockdown for three weeks), estimated cases will drastically reduce to 1 per 100,000—or a total of 13,800 cases.

India's current efforts at mitigation are only one part of the policy response. The second is assessing the preparedness of India's healthcare infrastructure. It is not a moment too soon to assess India's healthcare capacity and the healthcare system's ability to deal with large numbers,[1] because the union government's declared lockdown will end in a few weeks and India needs to formulate its testing and treatment policy.

We assess India's healthcare capacity and confirm that India has very poor health infrastructure funding and personnel,[2] and that overall, India's healthcare system is fragile in the

[1] India's poor state capacity across all areas of governance is well known but covers a very vast area. Vaishnav (2019) divides weak capacity into three categories—personnel, paperwork, and process. He argues that despite the talk of India's overbearing government, a closer look reveals that the state is severely undermanned. Rajagopalan and Tabarrok (2019) argue that India's state capacity is a result of overburdening, as the government attempts to do too much too soon by mimicking other countries. There is also a vast literature on the gap between the elite planning at the top and the street-level bureaucracy executing those plans. This dissonance between the two levels has led Pritchett (2009) to dub India a flailing state, where the head does not control the limbs. For the purposes of assessing healthcare capacity in dealing with COVID-19, we focus on personnel and funding.

[2] Our assessment is restricted to existing capacity and does not consider quality variations. There is much variation in quality across different providers and states, and this has important implications for healthcare outcomes. But, for

face of COVID-19. Given the weakness of India's healthcare system and the absence of a vaccine so far, we believe that the measures of mitigation, like the current lockdown, will have to continue for longer than three weeks. India has announced some relief targeting specific groups, including some in-kind transfers. But 275 million Indians are below the poverty line of $1.25 a day, and an additional 300–400 million are vulnerable to economic stress because they work in the informal sector, usually on daily wages. Given that at least 700 million people will face economic stress because of the lockdown, India needs to announce a universal basic income or similar direct cash transfer to 700 million economically stressed Indians for the next 3–4 months to buy time to build its healthcare infrastructure.[3] On the basis of our assessment of India's capacity, we make three specific policy recommendations.

First, we argue that India must rely primarily on the private sector and civil society to lead the response to COVID-19, and that the role of the government should be financing and subsidizing testing and treatment for those who cannot afford to pay. India's private healthcare system is better funded and better staffed than the government healthcare system, and it serves more people. It is estimated to be four times bigger in overall healthcare capacity, and it has 55 percent of the total hospital bed capacity, 90 percent of the doctors, and 80 percent of the

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the purpose of testing for and battling COVID-19 for the largest number of cases, number of facilities, personnel, etc. will matter most. Even quantity assessment without controlling for quality is a challenging task. There is no single methodology or source in each state or in the union government to track public and private healthcare capacity in India. The challenge is across three margins: (1) Myriad government agencies have their own methods of counting hospitals, doctors, workers, beds, etc. provisioned by the government, and different reports have quite different numbers across years. (2) Different metrics for the union, state, and local governments' healthcare facilities are not always easy to add or compare. (3) There is virtually no government data on private hospitals' capacity in terms of beds, doctors, health workers, etc., requiring some crude estimations of the largest sector of healthcare in India. We have used the best available data, reported by the union and state governments of India, and we have used consistent methods across all sources.

[3] A quasi–universal basic income of 2,500 rupees a month (which is the Indian poverty line) to the poorest 700 million for three months would amount to approximately 2.6 percent of India's GDP. This is a stimulus which India can, under these circumstances, afford, and without which millions of poor may die because of the lockdown and not the pandemic. Without this, the chances that the lockdown will be successful are low. Such a policy will also soften the aggregate demand contraction, which is inevitable during a countrywide lockdown.

ventilators. The temptation to requisition private resources for state use in an emergency is ever-present—but Indian policymakers must resist that temptation because it will compromise instead of increasing the capacity.

Second, India needs to recognize the large variation in healthcare capacity across different states, and respond by evaluating which states are at the highest risk of being overwhelmed by the pandemic. India's largest state, Uttar Pradesh, has the population of Brazil, while its smallest state, Sikkim, is closer in population to Bhutan. India's richest states, such as Goa, have a state GDP per capita comparable to that of Jordan, while the state GDP per capita of its poorest state, Bihar, is similar to that of Haiti. We analyze the variation in states across the following margins—GDP per capita, per capita spending on healthcare, hospital beds capacity, doctor and nurse capacity, and health. It is concerning that populous states with high density, such as Uttar Pradesh and Bihar, also have the weakest health infrastructure. India's union government must evaluate the variation in healthcare capacity and swiftly mobilize resources to help at-risk states with additional resources.

Third, India needs to evaluate the unevenness in its government healthcare sector when determining strategies for battling COVID-19. Variation in government healthcare capacity within each state is suddenly a matter of concern because of lockdowns, travel bans, and the inability of patients to cross state borders to access healthcare. Historically, across states, private-sector healthcare has clustered around urban and peri-urban areas, and state governments have devoted more resources and attention to rural areas. Consequently, most of the government capacity is in rural areas. As urban areas are at greater risk in the COVID-19 pandemic, the government healthcare sector is not in a good position to respond swiftly. It is important for

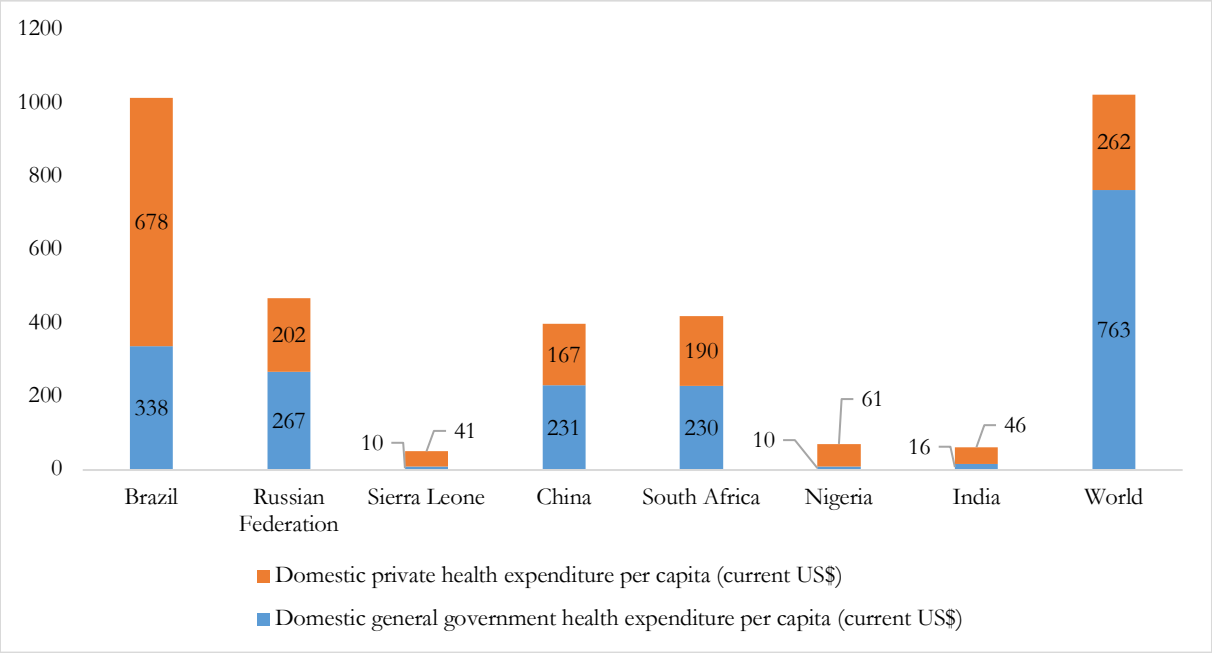
state-level governments to assess urban and rural healthcare infrastructure, and identify additional capacity from rural areas, if any, that could be mobilized to urban areas.

Public-Sector vs. Private-Sector Healthcare in India

India's healthcare system is a mix of government healthcare, which is free or largely subsidized for users, and private-sector healthcare, which operates similarly to a free market, in terms of the pricing of services, though it is highly regulated as a business. The government healthcare delivery system is primarily provided by state governments and financed by taxes. Private-sector healthcare in India is almost entirely financed by out-of-pocket payments, and most patients are not covered by insurance. Most Indians working in the private sector do not have health insurance and pay for expenses out of pocket. Most government employees, civil servants, military personnel, railway employees, and so on are enrolled in a mandatory health insurance program provided by their employer (the union or state government). Indians spend 3.66 percent of GDP on healthcare as of 2016 (World Bank 2020b) and the government spends 1.17 percent of GDP on healthcare, the lowest amount among emerging economies (Central Bureau of Health Intelligence 2019, p. 172).

Figure 1 shows the 2016 per capita private and public healthcare expenditures of the BRICS nations (Brazil, Russia, India, China, and South Africa) and some other countries comparable to India. Despite the fact that India is comparable to China in population, India's healthcare spending per capita is closer to that of Sierra Leone and Nigeria. In the past few years, India has seen a push toward strengthening healthcare and sanitation infrastructure, but even with the push, annual government healthcare spending per capita was only 1,657 rupees (US$21.68) in 2017–2018 (National Health Accounts Cell 2018).

Figure 1. Private and Public Healthcare Expenditures per Capita, 2016 (in 2020 US dollars)



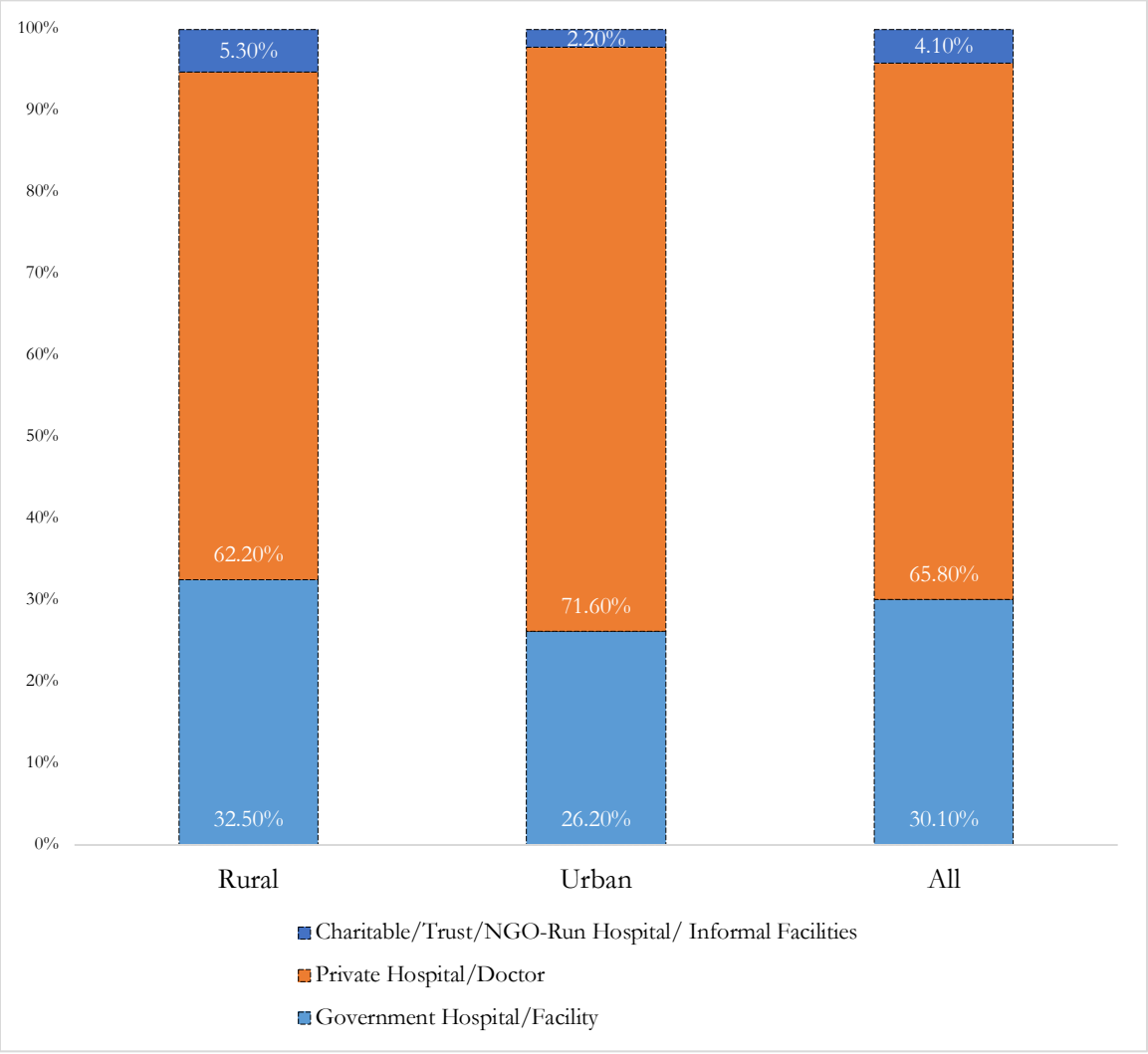
Sources: World Bank (2020a) and World Bank (2020b).

The government healthcare system is free or, for some facilities, highly subsidized. But there are enormous gaps in delivery and quality (Das et al. 2012). Survey data from the Seventy-Fifth Round of the National Sample Survey (July 2017–June 2018) detail how individuals use the healthcare system in India. This survey, which collected data from 113,823 households, consisting of 555,114 persons spread over every urban and rural district of the country, is thus the most comprehensive source for understanding how and when Indians choose and spend on healthcare (National Statistical Office 2019).

In figure 2, we show the treatment of ailments by service provider for both inpatient and outpatient treatments. Patients receive treatment for ailments through (1) the public healthcare system (this includes primary health centres, community health centres, district hospitals, sub-divisional hospitals, and sub-district hospitals); (2) the private sector (which comprises private

hospitals and private doctors and clinics); and (3) charitable providers, nongovernmental organizations, and informal providers. Even though private healthcare providers tend to be clustered in urban areas, Indians in rural areas prefer to travel to urban areas to receive quality treatment. Overall, patients only receive 30.1 percent of treatments at government hospitals and facilities and receive 65.8 percent of treatments from private hospitals and doctors, with the remaining 4.1 percent through charitable hospitals and informal providers.

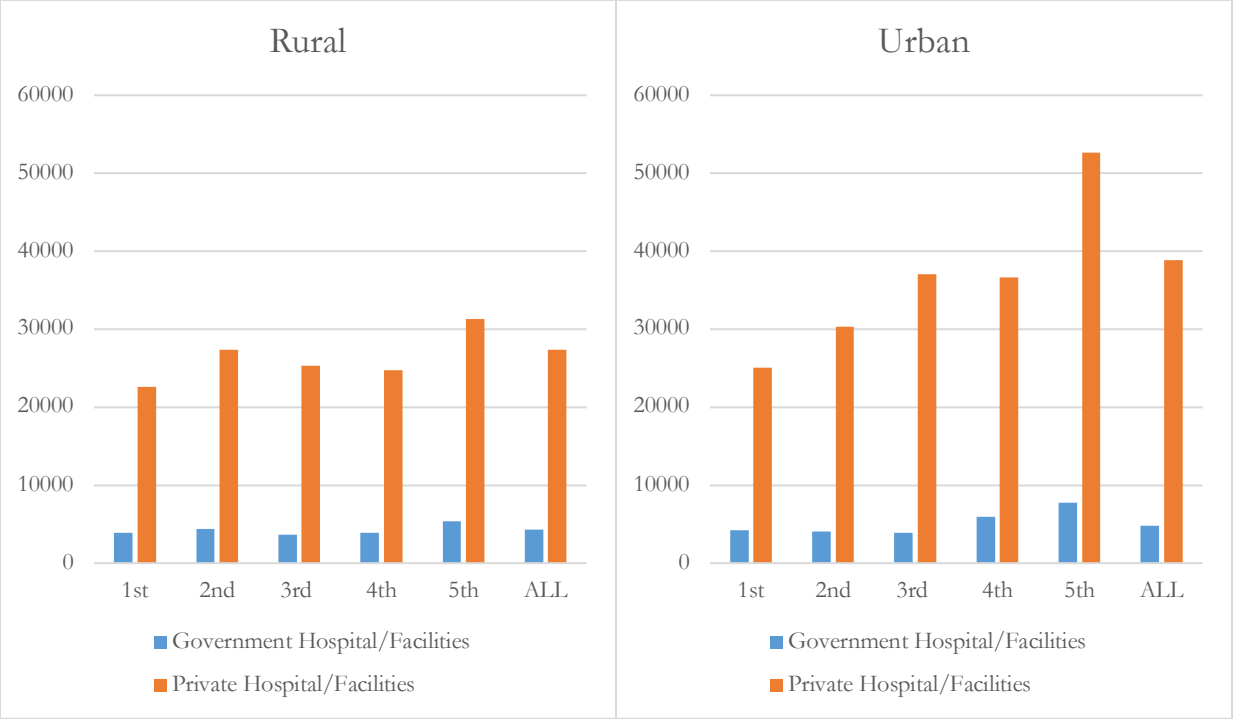
Figure 2. Treatment of Ailments by Type of Healthcare Service Provider, 2018



Source: National Statistical Office (2019).

Even for hospitalization, which is far more expensive in private facilities than in the free or mostly subsidized government facilities, Indians prefer private healthcare. Across all socioeconomic groups, Indians spend six to eight times more on private-sector treatment than the amount they spend at government hospitals in cases of hospitalization. Figure 3 shows that across every quintile of household expenditure,[4] Indians spend more on private healthcare than on government healthcare.

Figure 3. Average Medical Expenditure Incurred for Treatment during Stay at Hospital per Case of Hospitalization, by Quintiles and by Type of Hospital and Sector, 2017–2018 (in 2018 Indian rupees)



Source: National Statistical Office (2019).

[4] Household expenditure is better than income as a measure for healthcare expenses because most Indians rely on savings, and borrowing from family and friends, to pay for out-of-pocket healthcare expenses, as detailed in the Seventy-Fifth Round of the National Sample Survey (July 2017–June 2018).

The government-reported figure for the total number of government hospital beds (in all states and union territories) is 739,024 (Government of India 2018). This includes all primary health centres, community health centres, district hospitals, sub-divisional hospitals, and sub-district hospitals.[5]

The consulting firm McKinsey estimates that private-sector bed capacity exceeds the bed capacity of the public hospitals, though there is no central database that tracks the total number of private hospital beds.[6] In McKinsey's estimation, private hospitals and clinics made up 63 percent of India's overall healthcare capacity in 2010 and expected to grow faster than government facilities (McKinsey & Company 2012), but this is across India and does not discuss variation in private healthcare capacity across states.

It is important to estimate the overall beds capacity beyond the government hospital beds because, as seen above, Indians prefer the private-sector healthcare even though it is more expensive, and only counting government hospital beds is an underestimate of overall capacity. We estimate bed capacity in the private sector across all states to evaluate total capacity.

First, we use union government data for total government hospital beds in each state.[7] Second, we use the Seventy-Fifth Round of the National Sample Survey (July 2017–June 2018), which reports hospitalization (excluding childbirth) in government, private, and charitable hospitals in each state, to determine the proportional size of the government, private, and

[5] This does not include other government capacity reserved for certain classes and not available to all, such as hospitals operated by the Ministry of Defence (34,520), the Indian Railways (13,748), and the State Employee Insurance Corporations (19,765), as well as AYUSH Hospitals (Ayurveda, Unani, Siddha, and Homeopathy) (55,242). If we include all these government facilities, the total number of beds reported in government hospitals across India is 862,299.

[6] The government regulates all private hospitals and facilities, but there is no record of the number, size, and capacity of private hospitals across all states in India.

[7] For the latest disaggregated data on beds we use Rajya Sabha Unstarred Question No. 737, "Hospitals in the Country," July 24, 2018, which details the state/union territory–wide numbers on primary health centres, community health centres, district hospitals, sub-divisional hospitals and sub-district hospitals in the country.

charitable sectors in hospital beds.[8] Combining the two measures, we calculate the private hospital and charitable hospital bed capacity for each state.[9] Figure 4 shows the total of reported government-sector bed capacity and our estimated private-sector bed capacity across states.

The total number of hospital beds in India is 1,759,580, with the actual total beds in the government hospitals at 739,024, the estimated total beds in private hospitals across all states at 973,048, and the estimated total beds in charitable hospitals at 47,508. Across all sectors, we estimate that India has about 131 beds per 100,000 persons.

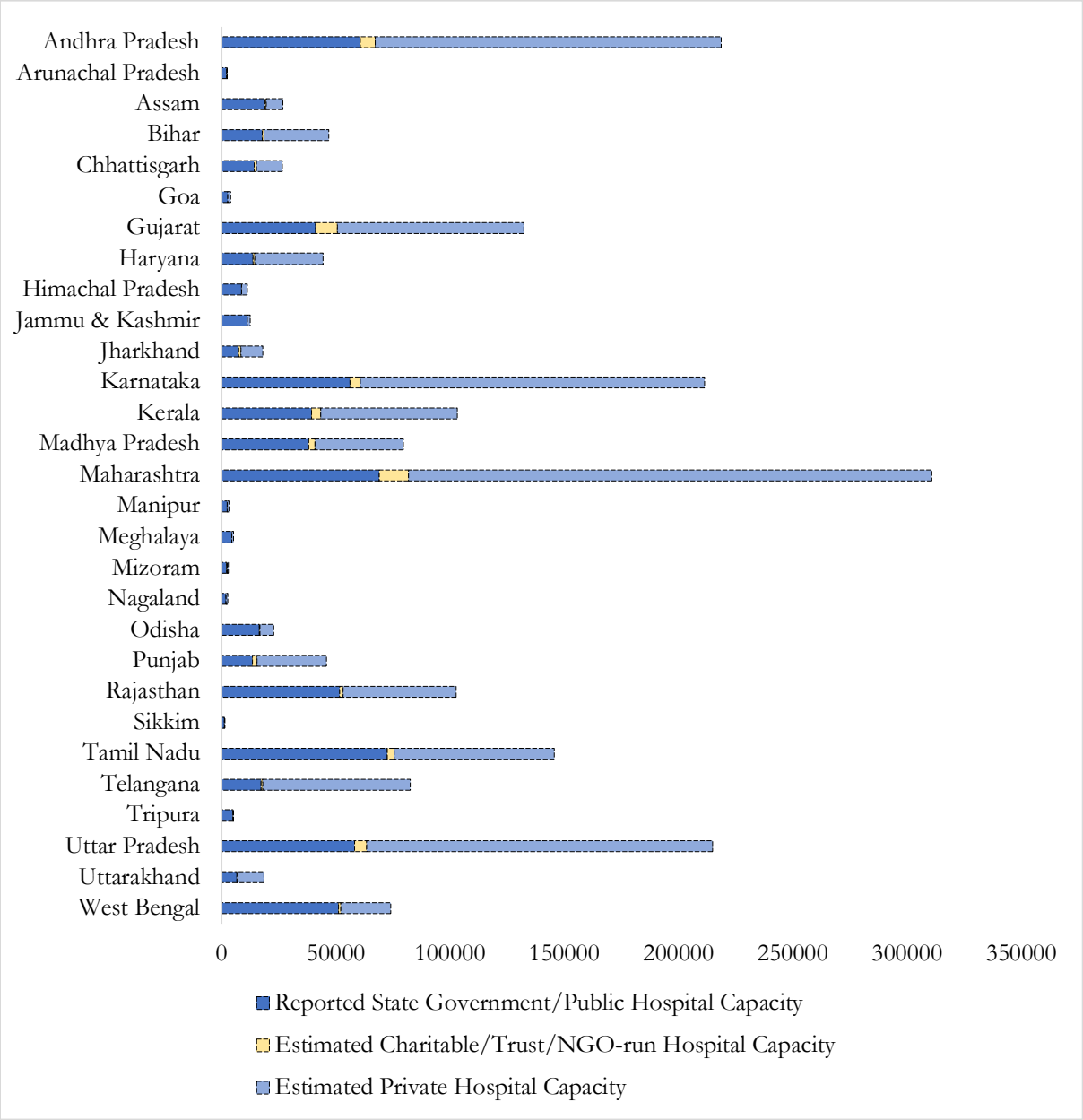
This is the total number of beds, not the available beds—because people with ailments other than COVID-19 usually occupy at least two-thirds of the bed capacity at any given time, with overcrowding and occupancy above 100 percent of reported beds in certain government hospitals. Even with the current lockdown, it is unreasonable to assume that more than 40–50 percent of the total beds can be made available for COVID-19 patients.

The number of beds in ICUs, or critical care beds, constitute a fraction of the total. A 2008 study estimated ICU beds in large public teaching hospitals at 5 percent of the total beds and in a selected few large public and private urban hospitals at 10 percent (Yeolekar and Mehta 2008). Five percent of the total number of beds in India is 87,979. But ICUs typically operate at full or close to full capacity because of the high cost, and only a fraction of the existing ICU beds will become available for COVID-19 patients. In most rural primary health centers, there are no intensive or critical care facilities.

[8] Estimates are based on National Statistical Office (2019)—table A13 in appendix A of the Seventy-Fifth Round of the National Sample Survey (July 2017–June 2018), Key Indicators of Social Consumption in India: Health (June 2018).

[9] This is an estimation, based on excellent survey data of the experience of Indians across every urban and rural district of the country. But this is only a simple calculation based on the relative sizes of government-sector, private-sector, and charitable-sector hospitalization. Therefore, it is only the estimated capacity of the hospital beds in the private sector and the charitable sector, based on the percentage of hospitalization by sector from the survey conducted in the Seventy-Fifth Round of the National Sample Survey (July 2017–June 2018), and should not be confused with actual capacity.

Figure 4. Total Beds Available in Government Hospitals and Estimated Bed Capacity in Private and Charitable Hospitals by State, 2018



Sources: For Reported State Government/Public Hospital Capacity: Government of India (2018). Estimated Private Sector and Charitable/Trust/NGO-run Hospital Capacity estimated by authors using National Statistical Office (2019).

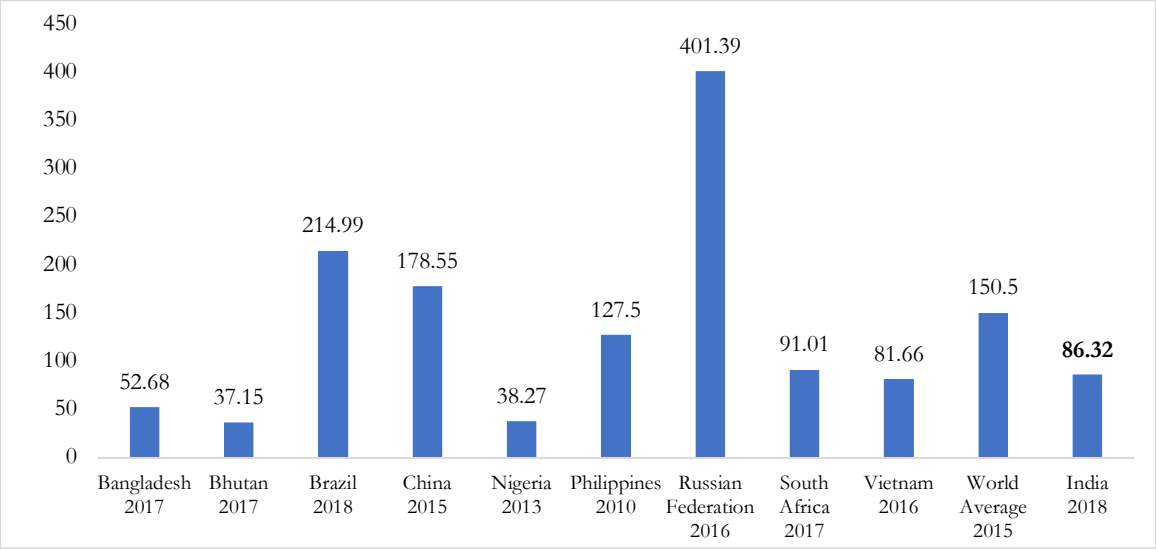
Since 55 percent of India's hospital bed capacity comes from the private sector, the number of beds can be quickly increased if the government incentivizes private healthcare. This is best done through government financing—that is, the government pays for the tests,

quarantine facilities, and treatment of those who cannot afford to use the private sector. The number of hospital beds and other facilities will quickly respond to market forces.

This is particularly true for noncritical patients, such as those requiring quarantine. For instance, hoteliers such as Anand Mahindra have already offered beds in hotels and resorts as temporary quarantine and healthcare facilities in India (Pandey 2020). Given the complete lockdown, hotel room capacity in India can be quite easily and swiftly repurposed for COVID-19 use with the right incentives.

Trained healthcare personnel, however, are a different matter, and cannot be easily increased in number in a matter of weeks. India has a total of 1.154 million doctors registered with the Medical Council of India and state medical councils (Central Bureau of Health Intelligence 2019, p. 221), approximately 86.32 doctors per 100,000 persons (see figure 5).

Figure 5. Doctors per 100,000 Persons in India and Comparable Countries



Sources: World Bank (2020c). For the latest Indian data on registered doctors: Central Bureau of Health Intelligence (2019).

Despite India's relatively low healthcare spending per capita, India does not compare poorly in doctor capacity, particularly with countries at a similar healthcare spending per capita. However, doctors cannot operate in a vacuum, and if other healthcare infrastructure per capita is weak or lacking, just having more doctors may not improve health outcomes. On the other hand, supporting a limited number of doctors with streamlined processes and infrastructure might improve health outcomes and reduce fatalities.

Only 10 percent of all registered doctors work in government hospitals and 90 percent are in the nongovernment sector (Central Bureau of Health Intelligence 2019, p. 226). Most doctors in the private sector work in private hospitals, individual and group practices, and small clinics and nursing homes. Some work in charitable hospitals, and some proportion of registered doctors no longer work as physicians (e.g., they are retired, or work in research or another industry). One reason that most doctors work in the private sector is that the private sector provides the bulk of the healthcare in India and can attract more and perhaps better talent by paying more and by providing better overall healthcare equipment and infrastructure that can improve doctors' performance. There is a lot of variation across states between doctors in government hospitals and in the private sector. (This will be discussed in the next section.)

India has about 2 million registered nurses and registered midwives and an additional 860,000 auxiliary nurse midwives. Most of the registered nurses work in the private sector. In the past two decades, the government has made a big push to improve women's health and neonatal health, and a large proportion of the auxiliary midwives work in the government healthcare system, especially in rural areas.

For COVID-19, a key instrument in a mitigation strategy is testing, and the government is in the process of authorizing existing labs and also creating new testing capacity. As of March

31, 2020, testing capacity in India is very low because the government has only approved 132 labs (public and private). If we are to assume equal capacity among all the 132 COVID-19 testing facilities in India listed by the Indian Council of Medical Research as using the RT-PCR (real-time reverse transcription–polymerase chain reaction) method, then in terms of access, there is approximately one testing facility per 10 million in population (0.0992 centers per million), and all 132 facilities put together can test a maximum of 10,000 samples a day (Sherriff 2020). However, this may change quickly, as the Indian Council of Medical Research is assessing and approving testing centers every week.

As of March 25, 2020, the council has invited bids to procure 1 million serological antibody kits for COVID-19 testing, which will exponentially ramp up the testing capacity. This is a good start, but there are many problems in scaling up tests and other health infrastructure in India, even through the private sector, because of bottlenecks in the government. For instance, there is only one institution currently in charge of the procurement of personal protective equipment. This is HLL Lifecare, a firm owned by the government of India. The procurement process announced by the Indian government requires every manufacturer of personal protective equipment to send equipment kits to HLL Lifecare, which will then assemble the equipment and send it to the different state and union government hospitals treating COVID-19 patients (Krishnan 2020). This has created a bottleneck of medical equipment that is urgently needed by India's healthcare workers. The process is so slow that HLL Lifecare is only able to serve a handful of union government hospitals, leaving most of the healthcare infrastructure stranded. At the moment, HLL Lifecare does not even have the ability to swiftly procure equipment from India's private sector on the scale required for India. Having a single procurement agency in the government will stifle any private-sector response.

India is testing in the low hundreds per day at the moment, and is only testing those who have either traveled to an affected area or been in contact with someone who has tested positive. To test at the same level as South Korea, India needs to conduct 8 million tests during its 21-day lockdown, or 385,000 tests a day.[10] It is far beyond the government healthcare capacity to conduct 385,000 tests a day. India needs to test essential services personnel and to have mobile testing to collect samples randomly, as well as from those affected. The union government must pay private labs to test at an unprecedented scale, and state governments should focus on paying for private labs to test, as well as paying for isolation and quarantine facilities for the poor who live in slums or single-room homes, or do not have access to clean piped water and sanitation facilities.

Given that India needs to rely on a large and swift private-sector response, the union government must focus on two areas. First, it must focus on funding. So far, the union government has announced 150 billion rupees (approximately US$2 billion, amounting to US$1.50 per capita) to battle COVID-19. This number is too low, and should be increased by a factor of 100, given the scale of India. If union government funds are used for testing and treatment irrespective of the type of facility, then the private sector will respond quickly to increase capacity. Without additional funding for the poor, a majority of Indians will be excluded from private-sector facilities because these facilities will have no incentive to increase capacity for patients who cannot afford to pay.

Second, the union and state governments need to identify regulatory bottlenecks, and the current supply-chain bottlenecks caused by the countrywide lockdown. The procurement problems of HLL Lifecare offer one example of a regulatory bottleneck. Others are caused by the

[10] South Korea tested extensively, and has so far tested 300,000 people out of its population of 50 million—i.e., 600 tests per 100,000.

lockdown. For instance, not only pharmacies and pharmaceuticals manufacturers but also the manufacturers of the chemical ingredients in drugs must be recognized as essential services, without which India cannot scale up the manufacturing of medicines. Similarly, manufacturers of the inputs required for personal protective equipment such as masks also need to be opened during the lockdown. The union and state governments must identify these bottlenecks and update lockdown orders to assist the private sector.

State of Healthcare in Different States

India is a union of states with vastly different populations, state GDPs per capita, and state government capacities. Understanding and coping with the variation in the states will be critical for preparing capacity to deal with COVID-19. Most of the data in this section is pre–August 2019, and therefore we report healthcare capacity for 29 states.[11]

The health outcomes of different states also show a lot of variation. The Government of India's *Niti Aayog Healthy States Progressive India Report on the Ranks of States and Union Territories 2019* states that

> the health outcomes of some States are comparable to that of some upper middle-income countries and high income countries (for example, Neonatal Mortality Rate (NMR) in Kerala is similar to that of Brazil or Argentina), while some other States have health

[11] As of August 2019, when the Indian Parliament revoked Kashmir's special constitutional status and converted it into two union territories, India has 28 states and 9 union territories. But most of the data used in this analysis is pre-August 2019, and Jammu and Kashmir (including Ladakh) is treated as a state in government reports, so we report data for 29 states. Also, for Telangana, which was separated from Andhra Pradesh in 2014, some recent healthcare and expenditure data are not available or are aggregated with that of Andhra Pradesh. In these cases, we report data for 28 states. So the total capacity reported across India remains the same, but there are some data inconsistencies owing to recent events, especially newly carved states. In every instance, we have used the same state and union territory labels as the government reports, pre–August 2019. Because union territories are governed by the union government, they have been dropped from the analysis—because healthcare systems are not consistent across union territories, and most union territories are very small (the population of six of the seven reported union territories is 3.3 million). The only notable union territory missing from our analysis is the National Capital Region of Delhi, with a population of about 16 million. Delhi is a quasi-state for the purposes of healthcare, since it has a state legislature which makes healthcare policy for Delhi. But Delhi is also a union territory with a vast and functional union government healthcare system. And there is no consistent reporting on healthcare data for Delhi, because of which it is dropped from our analysis.

outcomes similar to that in the poorest countries in the world (for example, NMR in Odisha is close to that of Sierra Leone).

One reason for the high variation in health outcomes is healthcare capacity, which varies widely across states.

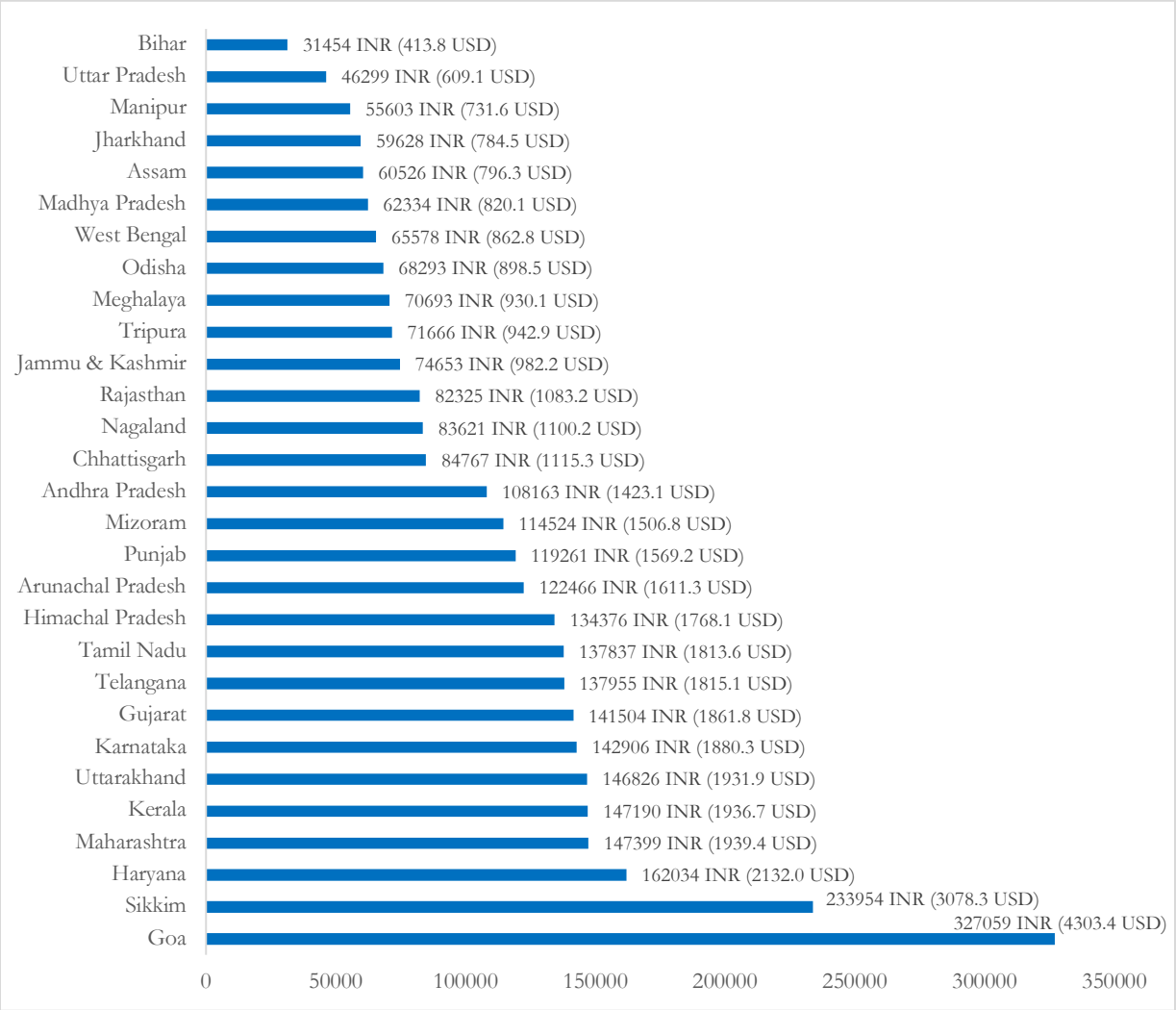
Indian states are divided on a linguistic basis, and therefore in addition to geographical variations there are also strong cultural differences, which affect health outcomes. In addition to geographical and cultural differences, there are differences in the resources at the disposal of each state, as well as differences in the priority afforded to the healthcare sector in each state. This variation in both the resources and the priority for healthcare becomes clear by studying three trends—GDP per capita, healthcare spending per capita by union and state governments, and expenditures on healthcare as a percentage of the overall state budget.

There is a strong relationship between GDP per capita and development outcomes, particularly around infant mortality and neonatal mortality rates. Figure 6 shows the GDP per capita of the states in 2018. Some of India's poorest states, such as Bihar, Uttar Pradesh, and Madhya Pradesh, are also its most populous states—a matter of concern in the context of a global pandemic.

Health is a state-level subject according to the division of powers in the Indian constitution. Since healthcare policy is made at the state level, healthcare spending per capita by state governments also shows high variation, because states use taxes to fund the government hospitals and facilities. Poorer states have lower capacity, in part because of their limited ability to raise revenue, which affects government spending on healthcare. Some healthcare spending is also funded through union government programs, though the amount varies by state, depending on the priority areas of the union government and on other political factors such as the timing of elections, the relationship of the union government to the political party forming the government

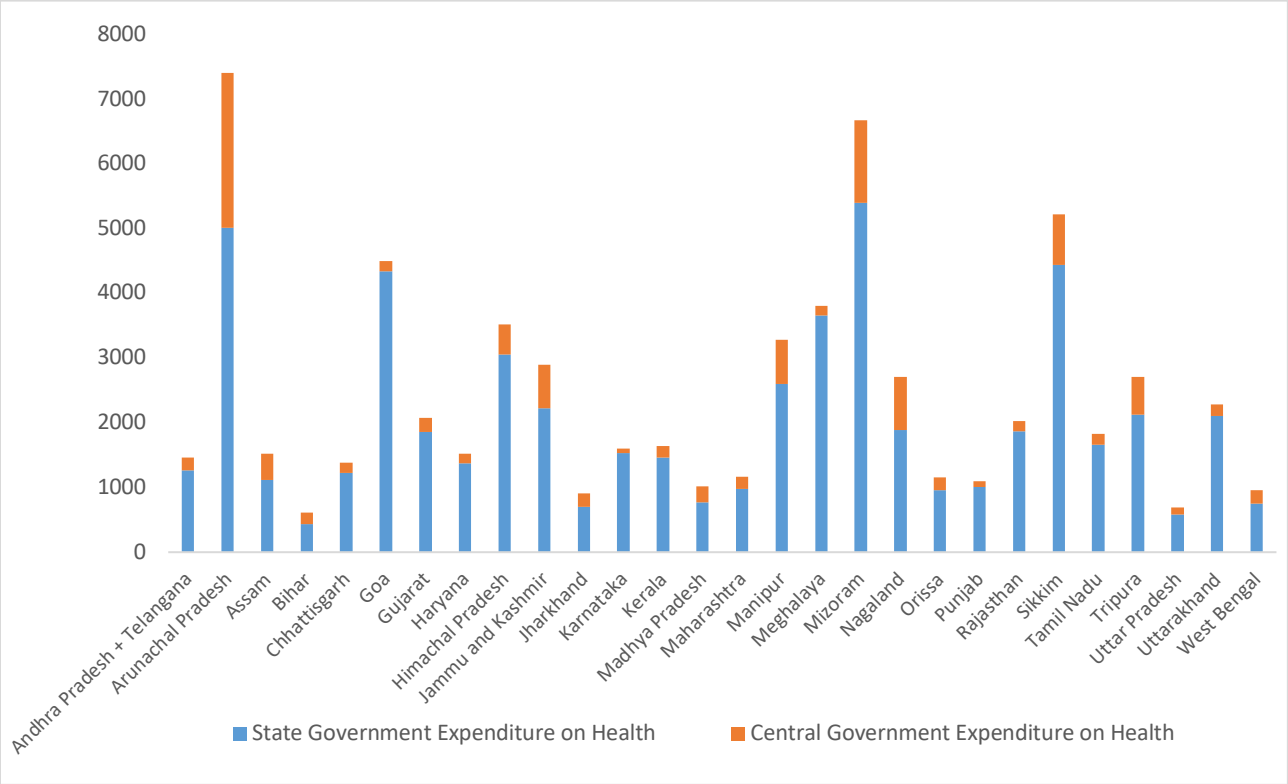
in a given state, and so forth. Figure 7 lists the per capita healthcare expenditure by the state government and the union government in each state in 2014–2015. There is a strong link between state GDP per capita and per capita government healthcare spending. Figure 7 also shows the amounts each state received from the union government for healthcare expenditures. Union government funds are not spread equally or proportionally across states.

Figure 6. State GDP per Capita, 2018



Note: 1 US dollar is approximately equal to 76 Indian rupees.
Source: Central Bureau of Health Intelligence (2019).

Figure 7. State-by-State per Capita Expenditures of State and Union Governments on Healthcare, 2014–2015 (in Indian rupees).

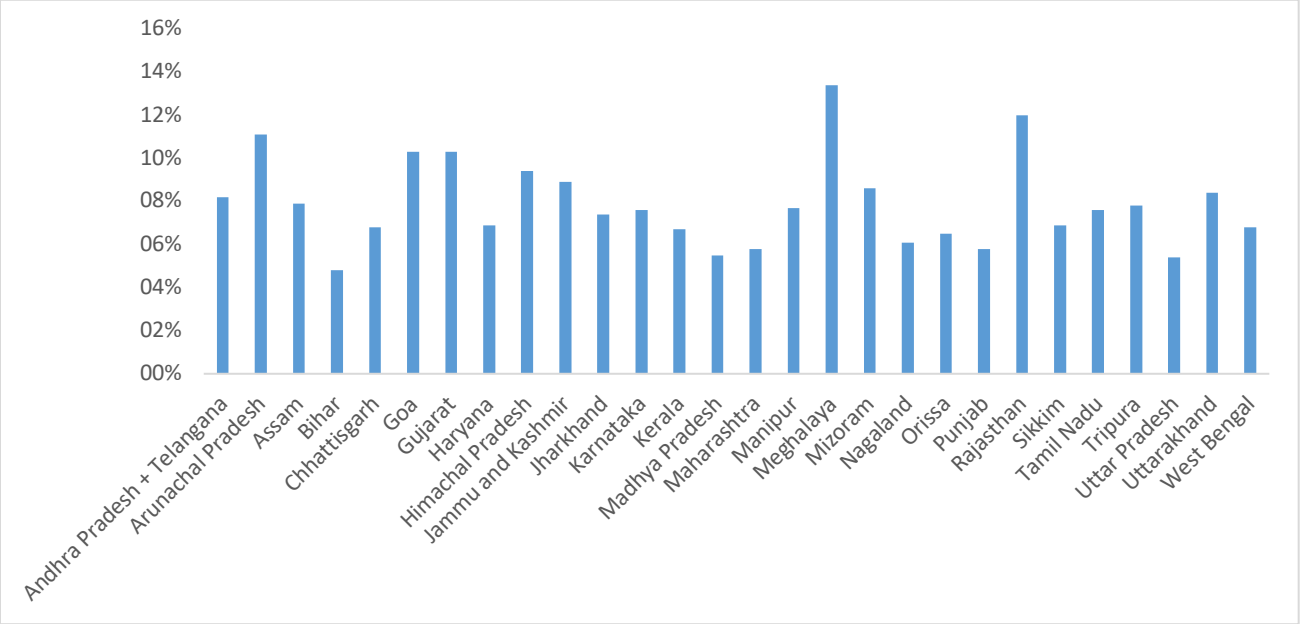


Note: Data for Mizoram were unavailable, and because data are from 2014, we only have access to aggregated data for Andhra Pradesh + Telangana. We are indebted to Prakhar Misra for this data source compiled from various state accounts.

Sources: State Accounts, Comptroller and Auditor General of India, https://cag.gov.in/state-accounts; Srinath et al. (2018).

Aside from the overall resources at the disposal of each state, the other source of variation is how each state prioritizes healthcare. Figure 8 shows the expenditure on health as a percentage of the overall state budget for each state. Poorer states also tend to prioritize healthcare less in their budget spending. Bihar and Uttar Pradesh, two of India's highly populous and poor states, have also not prioritized healthcare, with only 5 percent of these states' budgets allocated for healthcare.

Figure 8. Public Expenditure on Healthcare as a Percentage of State Budget, 2014–2015

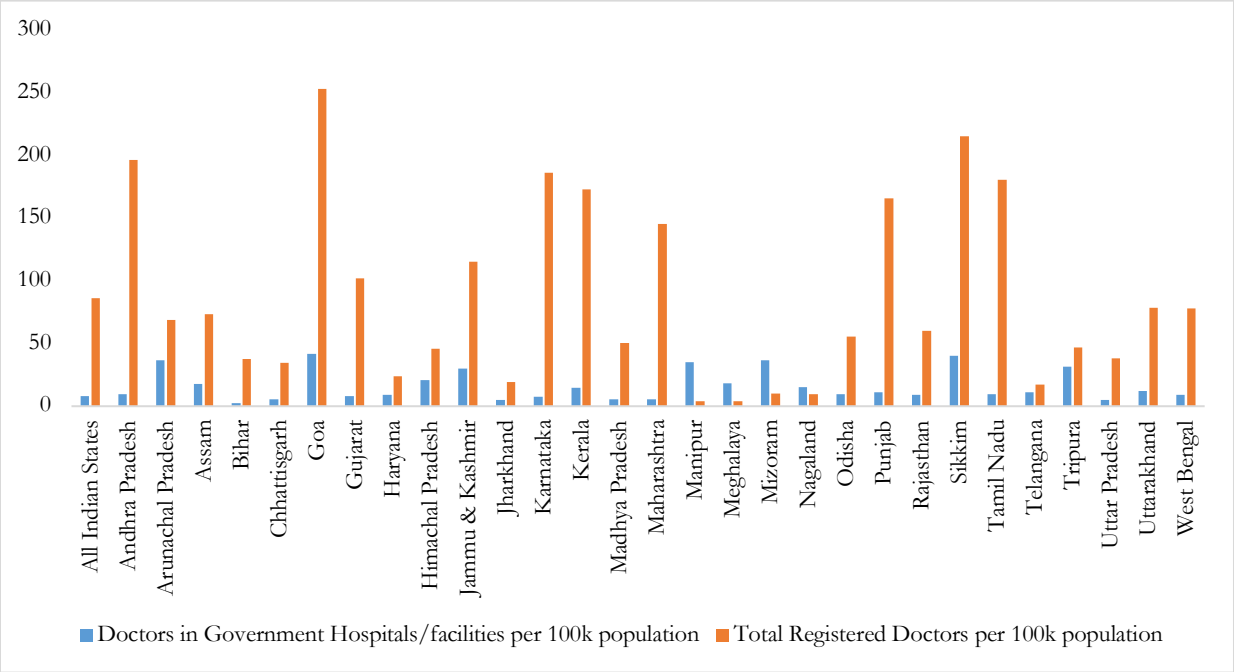


Note: Data for Mizoram were unavailable, and because data are from 2014, we only have access to aggregated data for Andhra Pradesh + Telangana. We are indebted to Prakhar Misra for this data source compiled from various state accounts.

Sources: State Accounts, Comptroller and Auditor General of India, https://cag.gov.in/state-accounts; Srinath et al. (2018).

First, there are large differences across states in the number of doctors registered in each state (see figure 9). Unsurprisingly, richer states, with higher per capita incomes, have more doctors, overall, both in the government sector and in the private sector. Second, the overall trend of most doctors serving in the private sector is also uneven across states. This is most likely because of the clustering of healthcare facilities in certain states and urban areas. For instance, Goa and Andhra Pradesh are known for large clusters, and patients tend to visit those hospitals for medical tourism.

Figure 9. Total Registered Doctors and Doctors in Government Hospitals per 100,000 Persons, 2018



Source: Central Bureau of Health Intelligence (2019).

Uttar Pradesh, India's largest state with a population of almost 200 million, is particularly underserved, with only 38 doctors per 100,000 persons. Other large and underserved states are Bihar (37 per 100,000), Chhattisgarh (34 per 100,000), and Jharkhand (13 per 100,000).[12] States with lower GDPs per capita have fewer doctors (per 100,000 persons) serving in government hospitals and facilities, and these states also have fewer doctors in private facilities. The reason is that these states have not prioritized healthcare in their budgets, nor do they have a rich populace that creates demand for a large private-sector healthcare system within the state. During the COVID-19 crisis, the union government has to pay attention and increase the capacity in the most densely populated areas of these states.

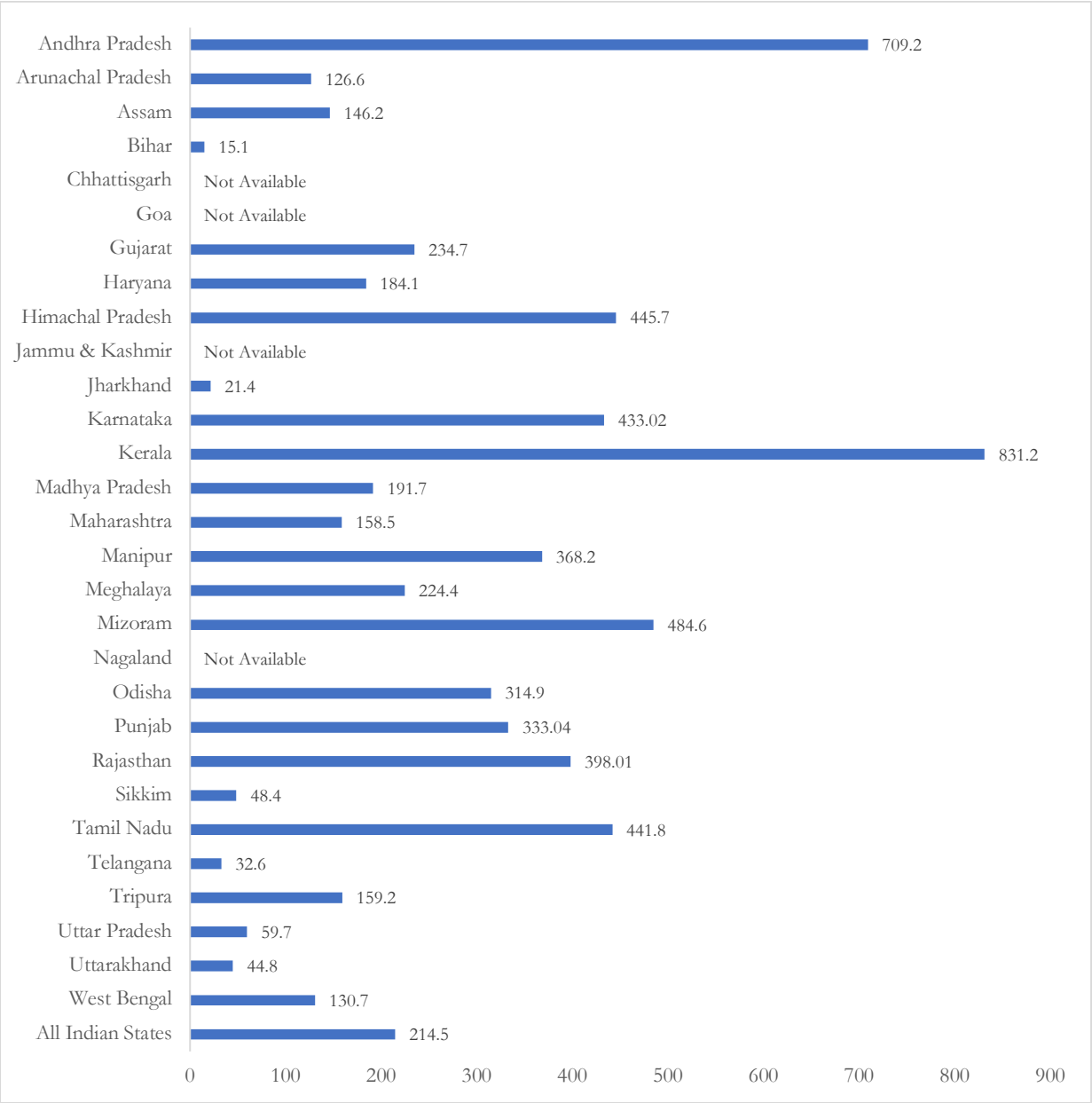
[12] Haryana has only 24 doctors per 100,000 persons, despite having a high GDP per capita. But it may not be underserved because its state capital is Chandigarh, which is both a union territory and also the capital of the state of Punjab. The Central Bureau of Health Intelligence and Medical Council of India do not report the number of doctors in Chandigarh.

The same is true for nursing staff per 100,000 persons, shown in figure 10. Registered nurses are mostly employed by the private sector. More recently, there has been a big push by the government to create a cadre of registered and auxiliary midwives for underserved rural areas, but data are not available on the exact number of nurses in the government sector versus the private sector in each state. Unsurprisingly, richer states, with higher per capita incomes, have more nurses, presumably because hospitals and doctors are clustered in rich urban areas.[13] Even with these reporting problems and lags, once again, as in the case of doctors, it is clear that Bihar and Jharkhand have very few nurses per 100,000 persons. And even though Bihar and Jharkhand have low doctor capacity, doctor capacity is proportionally not as low as nurse capacity. In states with low nurse capacity, doctors are not well supported and medical facilities need to supplement healthcare personnel with other trained staff to substitute for the lack of registered nurses.

To estimate bed capacity per 100,000 persons in states, we use the same estimation method used in figure 4, which reports the total estimated bed capacity across states. On this basis, figure 11 shows the known government-sector bed capacity and our estimated private-sector bed capacity per 100,000 persons across states.

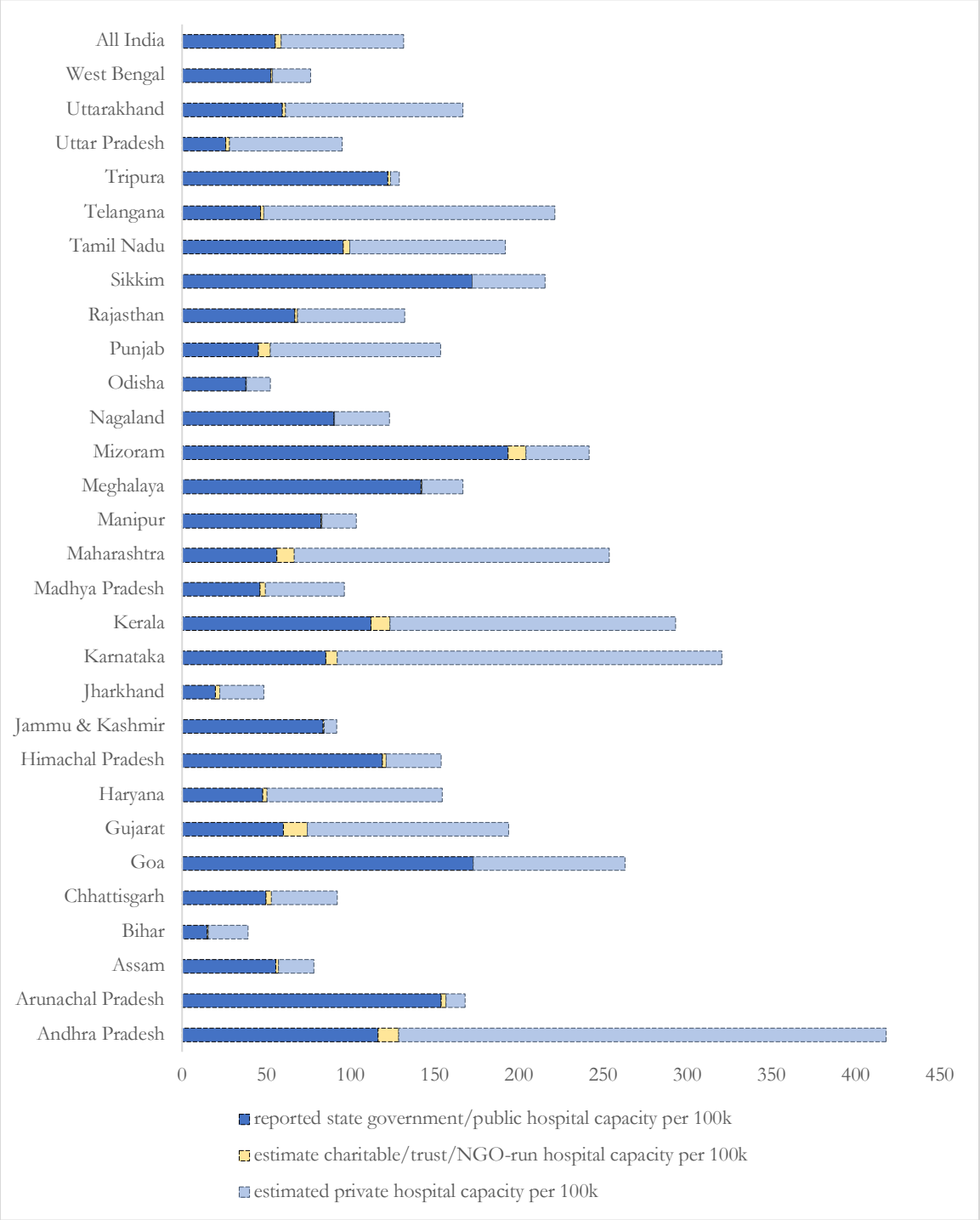
[13] An important clarification is that nurses typically register in their home state (or where they are trained) but do not always work in their home state, and there are some gaps in reporting these movements. Anecdotally, this explains the figure of 831 nurses per 100,000 persons in Kerala, a state that has the reputation of supplying the best nursing training and care across the country.

Figure 10. Registered Nurses per 100,000 Persons across States, 2018



Source: Central Bureau of Health Intelligence (2019).

Figure 11. Beds Available per 100,000 Persons in State Government Hospitals and Estimated Private-Sector and Nongovernmental Organization Capacity across States (based on 2018 numbers)



Sources: For reported state government/public hospital capacity: Government of India (2018). Estimated private sector and charitable/trust/NGO-run hospital capacity estimated by authors using National Statistical Office (2019). For state population forecasts: Health Management Information System (2019).

We estimate that India has an overall capacity of about 1.75 million hospital beds—about 131 beds per 100,000 persons. But, like other healthcare facilities, these beds are not evenly distributed across India, and there is a large variation across states. Unlike doctors and nurses, who may work in a different state from where they are registered, beds do not change location, and the reported numbers and the evidence of variation are very recent and quite accurate. Limited hospital bed capacity is concerning during the COVID-19 pandemic because the lockdown on domestic travel means that patients cannot be easily moved across state borders. Bihar, Jharkhand, Odisha, and West Bengal have the lowest numbers of beds per 100,000 persons, and these are large states with relatively high population densities.

COVID-19 cases require certain kinds of hospital facilities. The most severe cases need critical hospital care, in the form of ICU beds, ventilators, and so forth. India has to swiftly license more manufacturers to increase the number of ICU beds, ICU equipment, cardiac care equipment, ventilators, surgical equipment, and so on. Because ICU beds and related equipment are very expensive, hospitals typically operate ICUs at close to full capacity. For the patients who are critically ill because of COVID-19, only a fraction of India's 87,979 ICU beds will be available over the next few weeks.

Some estimate that there are half as many ventilators as ICU beds in India, and *The Economist* (2020) reports that India has at most 40,000 or so working ventilators. Another estimate reports 8,432 ventilators in the government sector and about 40,000 more ventilators across the country—mostly in the private sector (Chandna 2020). If every single one of these ventilators is working, then India has 3.7 ventilators per 100,000 persons. India has to make a massive push to increase the number of ICU beds and related equipment.

Though the private-sector response to the shortage in hospital beds, ventilators, and so forth will be faster, there are some areas where the government can act swiftly and use existing state capacity to battle COVID-19. For instance, the government can repurpose existing government facilities into quarantine and isolation facilities for those who have tested positive but do not need hospitalization. This will help contain the pandemic in very dense and poor areas, such as India's urban slums or single-room homes in rural areas. Those living in crowded slums do not have the room to self-isolate and quarantine, nor do they (and their families) have access to piped clean water and sanitation facilities. For those willing and able to isolate from their families and be quarantined, state-owned nonhospital facilities can be used as temporary quarantine and isolation wards. All government schools are currently closed and these buildings are required to have piped water and sanitation facilities, as well as kitchen facilities for the midday meal. These buildings can be quickly repurposed as quarantine facilities. Given the travel ban, Indian Railways has announced its plan to repurpose and partition railway cars into quarantine facilities with a nurse on call.

Also, currently most of the testing capacity is in hospitals and medical colleges. It is important to keep these facilities unburdened and uncrowded and to divert candidates for testing to other locations repurposed from existing state-owned buildings currently not in operation because of the shutdown.

Urban and Rural Capacity of State Government Healthcare

Variation in government healthcare capacity within each state is suddenly important and concerning because of lockdowns and travel bans. Owing to a complete shutdown of railways, state border checkpoints, and air travel, each state will have to reorganize its own capacity to

deal with the pandemic. If these bans and closures persist, the only reserve capacity is available from the union government and the army, with little or no support from other states.

Though the government sector only provides a proportion of overall healthcare capacity, and an especially small proportion in terms of trained doctors and nurses, it is useful to study the internal variations in government-sector healthcare within each state and across states. An important aspect is the variation between urban and rural areas.[14] There are large differences in per capita income between urban and rural areas, as well as differences in healthcare facilities. Some of the difference in per capita income and public health and sanitation facilities is reflected in the higher infant mortality and neonatal mortality rates of rural areas.

Typically, urban areas have better healthcare facilities, and have clusters of hospitals, clinics, doctors, nurses, and supporting facilities (McKinsey & Company 2012). Rural areas have historically been underserved by the government and the large-scale private healthcare sector. Since the 1990s, there has been a big push to improve rural healthcare—mainly by state-level governments—with a focus on women's and children's health. Indian states created rural facilities and a network of healthcare professionals and midwives with the intention of reducing neonatal and infant mortality in rural areas.

Within each state, state governments have doctors, healthcare facilities, and other healthcare workers distributed across the state. For most states, urban population density is eight to ten times rural population density. But usually there is a higher concentration of healthcare professionals in state healthcare facilities in rural areas compared to urban areas. The disproportionate deployment of state government resources in rural areas, while justified given

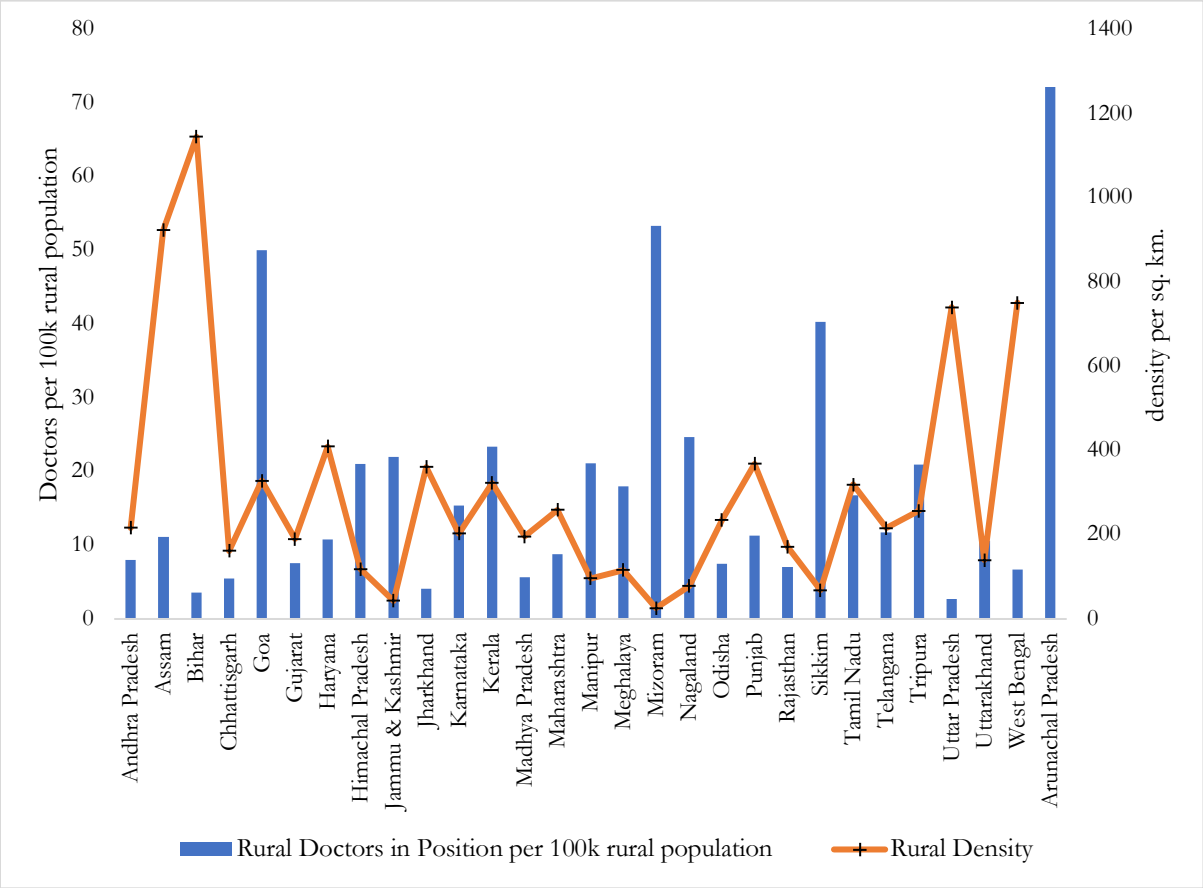
[14] There is a critique about how India misidentifies urban and rural areas because of definitional problems, meaning that many areas classified as rural are in fact far more urban in reality (Tandel et al. 2019). While we agree with this critique more generally, we use the government definition of urban and rural, because all the government data are reported on the basis of the government's definition of urban and rural areas.

the historical paucity of healthcare in rural areas, is suddenly a concern while battling COVID-19. The reason is that initial transmissions within India have been in cities, and like the global trend, most of the outbreaks are expected in urban and peri-urban settings. Given the higher population density and very weak government healthcare capacity in urban areas, each state must evaluate the advisability of moving its healthcare workers and doctors within the state to the higher-density areas on a case-by-case and district-by-district basis. Figures 12–15 show this problem of disproportionate deployment of resources.

Figure 12 shows government doctors per 100,000 persons in rural areas and population per square kilometer in rural areas for each state. Only 10 percent of all registered doctors work in government hospitals and facilities, so Indians relying on free rural government hospitals already face very low capacity. The problem is exacerbated in states that have a relatively high rural population density. As discussed above, states such as Bihar and Uttar Pradesh have few doctors overall, and particularly few government doctors. Bihar has 3.5 government doctors in rural areas per 100,000 persons, and Uttar Pradesh has only 2.7 government doctors in rural areas per 100,000 persons. These are alarming figures, but they become even more alarming given the relatively high rural population densities in both Bihar and Uttar Pradesh.

Figure 13 shows government doctors per 100,000 persons in urban areas and population per square kilometer in urban areas for each state. Government healthcare capacity has historically prioritized rural health, and thus government healthcare capacity in urban areas is almost nonexistent. Given the trend toward urban migration in the past two decades, the effects could be devastating for the urban poor during a COVID-19 outbreak, which is more likely in densely populated urban areas.

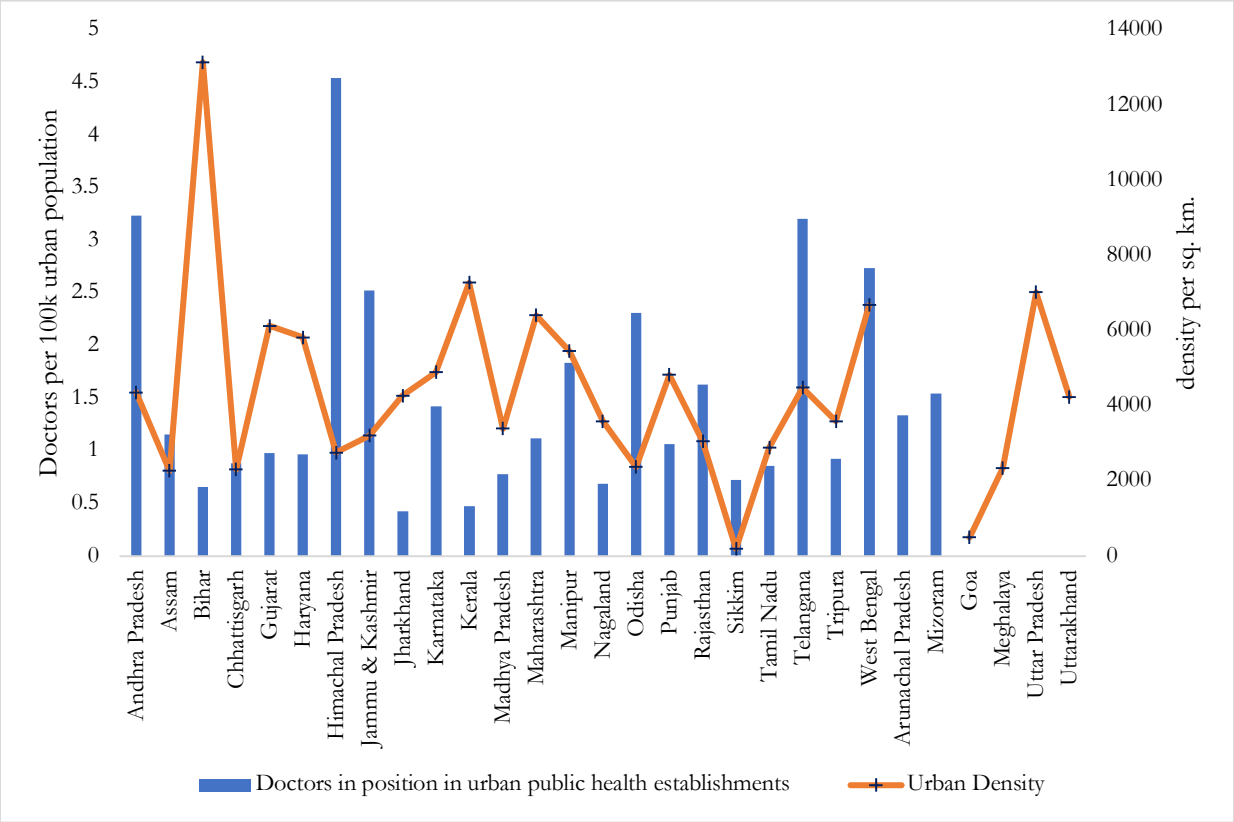
Figure 12. Government Doctors per 100,000 Persons and Population Density in Rural Areas, 2018



Note: Data on rural population density are not available for Arunachal Pradesh because of classification issues.
Source: Health Management Information System (2019).

In urban areas none of the states have more than 4.5 government doctors per 100,000 persons. Once again, Bihar's numbers are alarming: the state has only 0.5 government doctors in urban areas per 100,000 persons, but has an urban population density of more than 13,000 persons per square kilometer. The urban poor in Bihar, Haryana, and Jharkhand are at risk, because these states also have fewer doctors per 100,000 persons in the private sector.

Figure 13. Government Doctors per 100,000 Persons and Population Density in Urban Areas, 2018

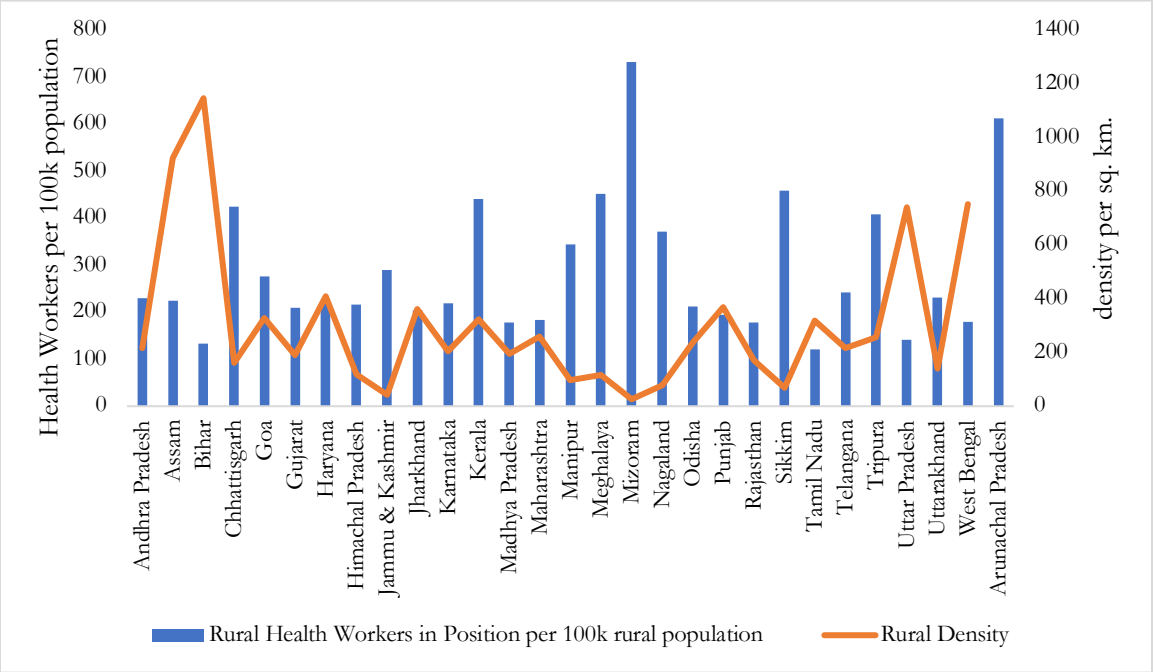


Note: Data are not available for urban population density of Arunachal Pradesh or Mizoram, and data on government doctors in position in urban areas are not available for Goa, Meghalaya, Uttar Pradesh, or Uttarakhand.
Source: Health Management Information System (2019).

Figure 14 shows a similar trend for government health workers per 100,000 persons in rural areas and for population per square kilometer in rural areas for each state. Health worker data for figures 14 and 15 include all support medical support staff (excluding doctors), as reported by the Rural Health Survey.[15]

[15] Health workers include health assistants, radiographers, pharmacists, lab technicians, nursing staff, ASHAs, and paramedical staff and health workers (as defined by the Rural Health Survey) working at primary health centres, community health centres, district hospitals, sub-divisional hospitals, and sub-district hospitals.

Figure 14. Government Health Workers per 100,000 Persons and Population Density in Rural Areas, 2018



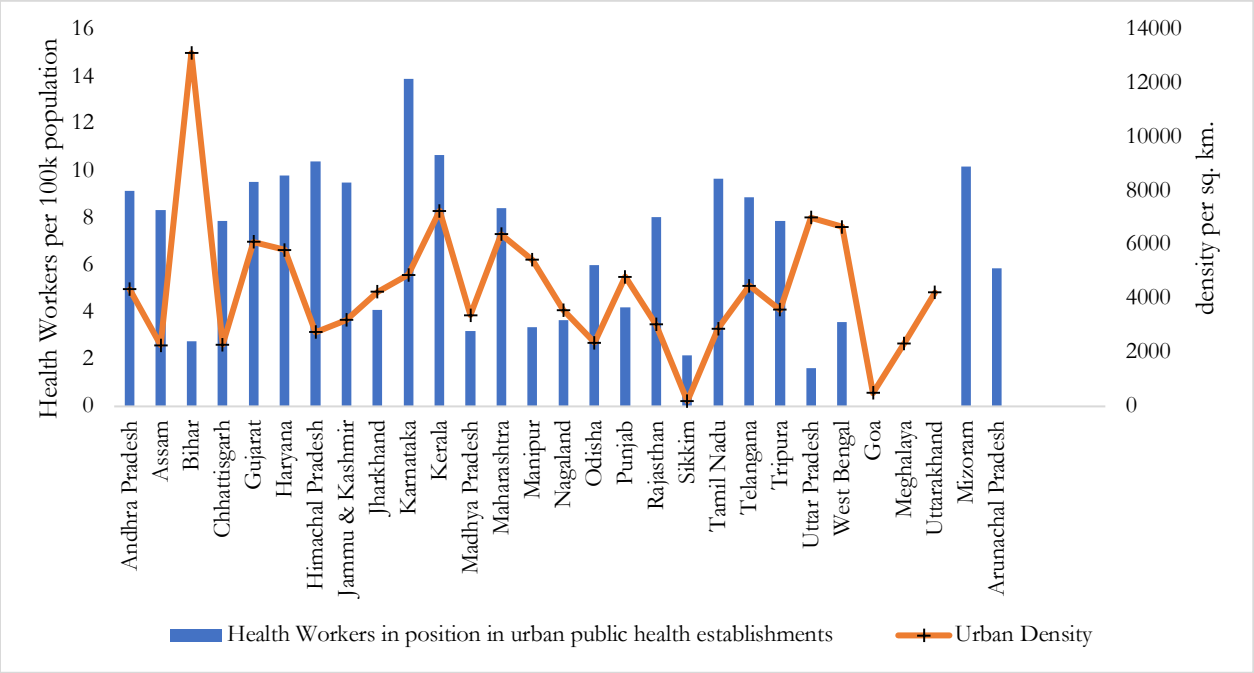
Note: Data on rural population density are not available for Arunachal Pradesh because of classification issues.
Source: Health Management Information System (2019).

Government-provided rural healthcare is relatively well staffed in terms of trained healthcare personnel, if we exclude doctors. But, once again, states such as Bihar and Uttar Pradesh have few health workers overall, and particularly given rural population density. Bihar has 132 government health workers in rural areas per 100,000 persons and Uttar Pradesh has only 141 government health workers in rural areas per 100,000 persons, and both states have relatively high rural population densities.

Figure 15 shows government health workers per 100,000 persons in urban areas and population per square kilometer in urban areas for each state. The number of urban health workers per 100,000 persons is less than 10 percent of the number of rural health workers per 100,000 persons. Bihar's numbers are alarming: the state has fewer than three government health

workers in urban areas per 100,000 persons, but has an urban population density of more than 13,000 persons per square kilometer.

Figure 15. Government Health Workers per 100,000 Persons and Population Density in Urban Areas, 2018



Note: Data on urban population density are not available for Arunachal Pradesh or Mizoram, and data on healthcare workers in position in urban areas are not available for Goa, Meghalaya, or Uttarakhand.

Source: Health Management Information System (2019).

Once again, this is very concerning during a potential COVID-19 outbreak in urban areas of states such as Bihar, Jharkhand, and Uttar Pradesh. There will be very few health workers to run facilities, administer tests, provide medication, maintain sanitation, and deal with even the mildest cases. None of the Indian states have more than 15 government health workers in urban areas per 100,000 persons.

Urban areas are much better served by the private sector, but the government cannot easily direct private-sector facilities to serve the urban poor in larger numbers without

announcing some kind of subsidy for out-of-pocket expenses. In the absence of such measures, the urban poor in several states are at high risk.

Conclusion

Our assessment of India's healthcare capacity reveals a system unequal to the COVID-19 pandemic. In the absence of large-scale testing, India needs to deploy masks on a large scale, adopt nonmedical diagnostic tools, and—most importantly—implement social distancing through lockdowns to deal with the COVID-19 pandemic. Lockdowns will have an economic cost and will have dire economic consequences for the 275 million Indians below the poverty line and the 300–400 million who are vulnerable to economic stress because they are daily wage earners or informal-sector workers. This can already be seen in the mass migration of daily wage laborers from big cities to their home districts.

But the economic cost of lockdowns will be dwarfed by the cost of losing millions of lives to COVID-19. If the rise of COVID-19 cases in India follows the pattern seen in Italy and Spain, the 700 million Indians vulnerable to economic stress are unlikely to receive access to quality healthcare and will represent a disproportionate number of fatalities.

It will be easier and quicker to immediately alleviate the economic stress caused by the lockdown through instruments such as a universal basic income or a similarly designed, non-means-tested direct cash transfer, and to use the lockdown to buy time to build more healthcare capacity swiftly. Increasing healthcare capacity will help India beyond the COVID-19 pandemic. It will have a long-term impact on reducing infant mortality, reducing morbidity, and increasing life expectancy.

Given the fact that India's private-sector healthcare system has more capacity to fight COVID-19 than government facilities, India will need to rely on and incentivize responses from

the private sector and civil society. This is best done by quickly increasing the budgets made available to fight COVID-19 and by removing bottlenecks such as single-point procurement agencies and price and quantity controls on essential medical equipment.

There is very high variation among states in government healthcare capacity. States with lower GDPs per capita have weak capacity on all margins—doctors, nurses, hospital beds, per capita spending on healthcare, and so forth. The union government needs to quickly step in to assist at-risk states in their COVID-19 response.

Densely populated urban areas are at great risk, and state-level governments can identify additional capacity from rural areas to serve urban areas.

The current lockdown will buy India some time to increase its healthcare capacity, and it must not squander this valuable opportunity. Given the state of healthcare capacity in India, in the absence of a vaccine, when the lockdown is lifted the COVID-19 pandemic will have catastrophic consequences, especially for the poor.

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Acknowledgments

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