



Learnings from India's COVID-19 Response and Furthering Medical Device Innovation

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■ Introduction

The learnings gleaned from the response of India's research and manufacturing ecosystem to the health crisis offer an opportunity to push for greater technology deepening in India's healthcare sector and develop an industrial and innovation policy for greater medical device innovation in India. Some of the other learnings include but are not limited to: the economic distress caused by a strict nationwide lockdown that was imposed in late March 2020, the handling of the migrant worker crisis, the sharp decline of 23.9 percent y-o-y in GDP in 1Q2021 followed by another contraction in GDP in 2Q2021, and the response to the various stimulus measures announced by the government and the Reserve Bank of India to support the economy. At the time of writing, there were over 1,40,000 COVID related deaths officially accounted for in India. According to news reports (Sheriff, 2020), a report by the Parliamentary Standing Committee on Health & Family Welfare titled 'The Outbreak of Pandemic COVID-19 and its management', has highlighted among other things, the poor health infrastructure in India, the lack of sufficient testing, poor contact tracing early on in the crisis, concerns about the reliability of testing kits, and the risks faced by vulnerable non-COVID patients especially women and children. Investment in India's healthcare infrastructure is a clear priority, and the budget for FY2022 is expected to see a significant increase in healthcare spending. At the same time, a structured approach to technology deepening in the healthcare sector, with a focus on medical device innovation has the potential to contribute towards sustaining India's economic recovery going forward. This article seeks to document the mission mode response that brought about several partnerships between industry, academia and government, the country's ability to focus on therapeutic drugs and plan for a vaccine, and the structure of India's industrial R&D as well as investments in public research that aided the response. While there were steps that had already been taken towards developing the medical devices sector in India prior to WHO's declaration of the pandemic, much more needs to be done to develop a successful industrial and innovation policy for this sector.

■ The mission mode response

The mission mode response by several public research laboratories, higher education institutions like the IITs, Indian industry and startups in the face of global supply chain disruptions and rising cases in India is laudable. Within a few months, starting March 2020, there was a significant ramp up in domestic production of ventilators, personal protective equipment (PPE) kits, testing kits, masks etc. The number of PPE kit manufacturers, according to news reports (Chandna, 2020), increased from around 20 in February 2020 to over 600 manufacturers by June 2020, whereas the number of ventilator manufacturers increased from around 8 in February 2020 to over 50 manufacturers by June 2020. News reports also mentioned that various components and parts for ventilators too were increasingly manufactured in India over this period. There were many instances of startups from the IITs tying up with larger manufacturing firms or government facilities, partnerships that were forged between government entities and private players, and between smaller firms and larger firms to increase production of ventilators, PPE kits, testing kits and alcohol-based sanitizers. By end June 2020 (Chandna, 2020), manufacturers appeared to be exploring the possibility of exporting some of these essential items. Research laboratories and manufacturers were able to reduce the cost of the reverse transcription polymerase chain reaction (RT-PCR) test kits, which in turn also saw state governments gradually lower the price caps on test kits to one-fourth of what the test kits cost early on in the pandemic. While the government had constituted empowered groups (Ghosh, 2020) to plan and implement the response to COVID-19, including one for medical equipment, the role and importance of industry associations in the response must also be acknowledged. Industry associations were able to coordinate for example between garment manufacturers and auto manufacturers for scaling up production of PPE kits, or link startups and smaller firms to larger auto manufacturers for the production of ventilators. While the coming together of industry, academia and government in mission mode is indeed commendable, the partnerships were nevertheless forced by circumstances. It is unclear whether many of these partnerships will continue in the post pandemic world. The auto manufacturers for example very likely began to return to their main line of business as the economy started to come out of the lockdowns that had been imposed. It is also unclear whether several of these ventilators

or PPE kits that were produced as an emergency response met the necessary quality standards for export, for them to have transitioned into a sustained business opportunity.

■ **Planning for a vaccine and therapeutic drugs**

India has over the years demonstrated its technological capabilities when it comes to vaccines and therapeutic drugs (Mani and Nabar, 2020). Manufacturers like the Serum Institute of India are known globally for their high quality and low cost vaccines. With respect to a vaccine for COVID-19, the Serum Institute has a tie up with the Oxford Vaccine Group to manufacture the 'Covishield' vaccine in India. In the case of therapeutic drugs for the treatment of COVID, there were six Indian pharmaceutical firms (BI India Bureau, 2020) that began manufacturing Remdesivir in India under a license agreement with Gilead Sciences. Remdesivir had been granted an Emergency Use Authorization by the USFDA in May 2020. Although the WHO has only recently issued a conditional recommendation (WHO, 2020) against the use of Remdesivir in the treatment of hospitalised patients, early on in the pandemic this drug had been considered a potentially effective antiviral drug for the treatment of COVID-19 patients. India must capitalize on its competitive position in the pharmaceutical industry and ensure that it is able to scale up production of the COVID-19 vaccine as well as generic versions of therapeutic drugs used for the treatment of COVID-19. This would not only require a focus on domestic policy and regulatory support for local manufacturing, but also enhanced global co-operation to ensure that the vaccines and therapeutic drugs are available at an affordable cost to many in the developing world. An important step that India took towards this was the joint proposal it made along with South Africa in early October 2020 to the WTO (tHoen, 2020), requesting for a waiver on intellectual property agreements related to vaccines, tests and treatments for COVID-19. The proposal however has been facing opposition from the EU and the US.

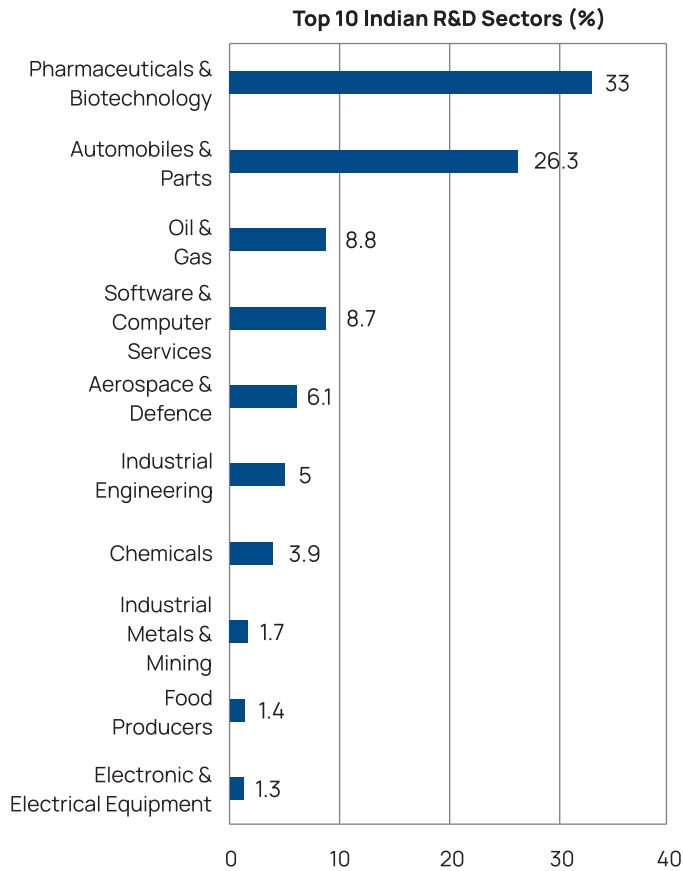
In recent months, there has also been increased planning for the eventual procurement and distribution of the vaccine for COVID-19. The planning has involved identifying and mapping cold chain facilities across India. For the purposes of administering the COVID-19 vaccine,

the Indian government plans to utilise the infrastructure that is part of its universal immunisation programme that is used to vaccinate children across the country against diseases like polio and measles (Chatterji, 2020). However, large investments in cold chain facilities with significant participation from the private sector would be required to successfully administer the COVID-19 vaccine to a large section of India's 1.4 billion population. According to news reports (Chatterji, 2020), there are presently around 29,000 cold chain facilities across India that could cater to around 60 million doses, with two doses potentially required per person. Investment in the infrastructure and logistics required to administer the COVID-19 vaccine will result in increased demand for items like glass vials, dry ice as well as commercial trucks that would need to be fitted with special cold storage units. In the long run, the increase in cold storage and transportation facilities also has the potential to benefit the agriculture sector.

■ **India's industrial and public R&D and the COVID response**

India's investment in R&D as a share of GDP at 0.7 percent has consistently remained low for several decades. The expenditure on R&D by Indian industry at USD 6.8 billion in 2019 is especially low, and accounts for just over 40 percent of the country's expenditure on R&D. Nevertheless, despite the low level of industrial R&D, we posit that it was the structure of India's industrial R&D seen in Figure 1, and its industrial base that allowed for the mission mode partnerships to emerge early on in the crisis.

Figure 1 Structure of India's industrial R&D

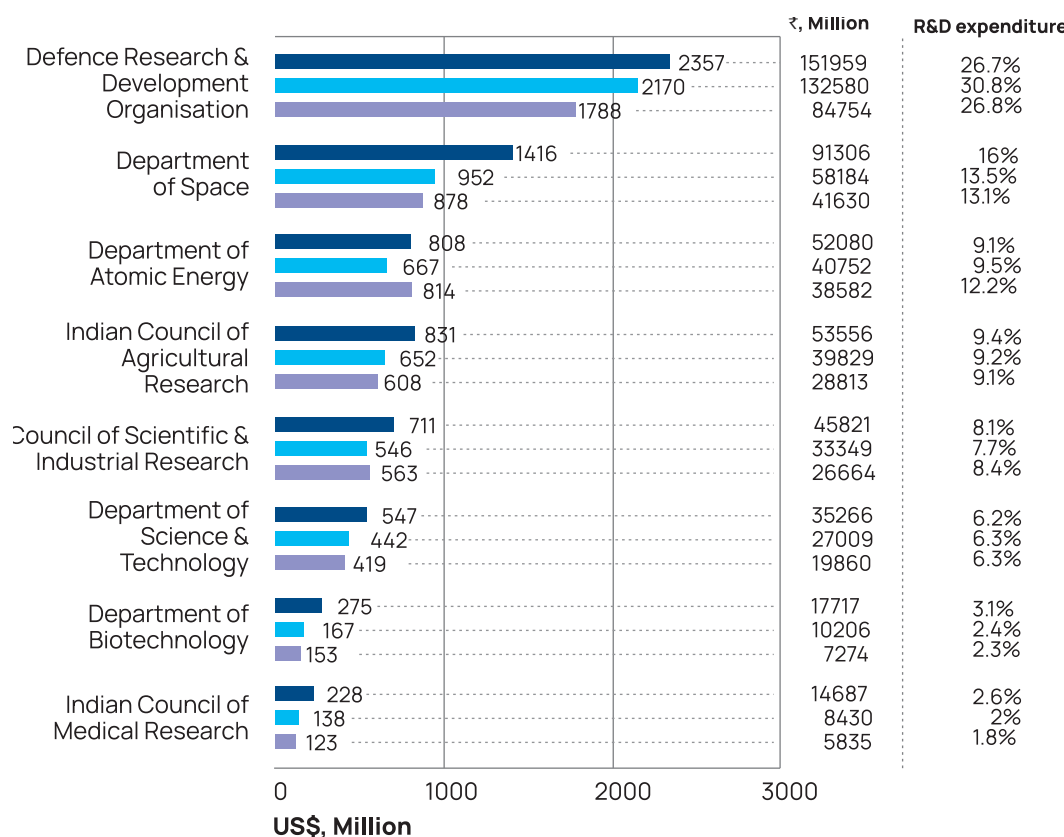


Source: Prowess, data downloaded on 30 September 2020 from the platform; ACE Equity, data downloaded on 7 July 2020 from the platform; Annual Reports (2018-19) of Indian companies; Ahmedabad University; Centre for Technology, Innovation and Economic Research (CTIER)

As highlighted above, sectors such as pharmaceuticals & biotechnology and the automobile & parts that were at the forefront of the response and account for around 60 percent of industrial R&D in India. The software & computer services sector that accounts for around 9 percent of industrial R&D spending has also been involved in the development of diagnostic healthcare technologies using artificial intelligence for the detection of COVID-19. India's public funded R&D institutions too have been at the forefront of the pandemic response. Public expenditure on healthcare R&D as a share of total expenditure on R&D by the central government was just 5.7 percent in 2017-18, taking into account the combined spending by the Indian Council of Medical Research (ICMR) and the Department of Biotechnology (DBT) in Figure 2.

However, the pandemic also saw labs from the Defence Research and Development Organisation (DRDO), the Indian Space Research

Figure 2 Public healthcare R&D expenditure by ICMR and DBT was 5.7 percent of Central Government R&D expenditure in 2017-18



Source: S&T Indicators Tables, Research and Development Statistics 2019-20 available at <https://dst.gov.in/sites/default/files/S%26T%20Indicators%20Tables%2C%202019-20.pdf>; Centre for Technology, Innovation and Economic Research (CTIER)

- Note: (i) Figures in rupees were converted to dollars using the USD-INR exchange rate of 47.4 calculated as an average for the fiscal year 2009-10 and the USD-INR exchange rate of 61.1 calculated as an average for the fiscal year 2014-15, and USD-INR exchange rate of 64.46 calculated as an average for the fiscal year 2017-18 based on data from Federal Reserve Bank of St Louis
- (ii) Total Central Government R&D Expenditure includes R&D Expenditure by Select Major Scientific Agencies and R&D Expenditure by Central Ministries/Departments other than Major Scientific Agencies. Total Central Government R&D expenditure was USD 8830 million in 2017-18 and USD 7053 million in 2014-15.
- (iii) Total National R&D expenditure for 2014-15 has been updated as per the latest figures released by DST

Organisation (ISRO) and the Indian Railways also joining the government's health research efforts. Thus, the share of public expenditure on healthcare R&D would have necessarily seen an increase in the current financial year. While the pandemic may have necessitated the ad hoc involvement of ISRO and the Railways, the Indian government should sustain the increased spending on healthcare R&D through ICMR and DBT going forward. Expenditure of around USD 1.6 billion on

healthcare research, would increase the share of healthcare R&D to 20 percent of the central government's overall expenditure on R&D, bringing the share closer to that of countries like the US and the UK.

■ **Designing policies for technology deepening to aid in India's economic recovery**

The country's economic policies should be designed in a way that would allow for greater technology deepening in sectors where India does have a presence on the global stage and allow for technology diversification into sectors like electronics where the country's absence is clearly visible. A structured approach to technology deepening and diversification would contribute towards sustaining India's economic recovery going forward. As can be seen in Table 1 below, while India has 13 firms present in the pharmaceuticals & biotechnology sector when it comes to top global R&D firms and sectors, it has no presence in the healthcare equipment & services sector. India also currently imports around 80 percent of its medical device needs (Nath, 2020), with medical device imports having been around USD 6 billion in FY2019-20 (Porecha, 2020). Developing a smart specialisation strategy (OECD, 2013) around medical devices would allow India to build on its competitive strength in the pharmaceuticals & biotechnology sector and ensure greater technology deepening in the healthcare sector. India has a tremendous opportunity to provide its citizens and the rest of the world with access to high quality and affordable healthcare equipment.

There are some positive steps that have already been taken towards developing India's medical device sector. The sector currently allows for 100 percent foreign direct investment in new ventures through the automatic route. In February 2020, the Ministry of Health and Family Welfare issued notifications through The Gazette of India that all medical devices would be regulated under the Drugs and Cosmetics Act, 1940 beginning 1 April 2020. The new Medical Devices (Amendment) Rules, 2020 builds on the Medical Devices Rules, 2017, and also specifies that all newly notified devices, whether manufactured in India or imported, would need to be registered with the Central Drugs Standard Control Organisation (CDSCO) within a specified time frame. The announcement in February signalled a move towards a unified regulator to ensure

Table 1 Sector-wise Global Industrial R&D Expenditure and Country-wise Number of Firms - India's Opportunity is in Healthcare Equipment & Services

Sector	R&D expenditure (US\$, Millions)	Total Number of Firms	Number of Firms									
			Select Advanced Economies				Select Emerging/Asian Economies					
			USA	UK	Germany	Japan	Brazil	China	India	Israel	South Korea	Taiwan
Pharmaceuticals & Biotechnology	176892	429	221	26	9	28	0	44	13	4	7	1
Technology Hardware & Equipment	147000	250	89	7	4	22	0	48	0	3	8	45
Automobiles & Parts	146961	150	22	4	15	33	0	36	7	0	8	4
Software & Computer Services	135367	285	150	14	5	7	1	61	4	7	3	3
Electronic & Electrical Equipment	73781	227	44	5	9	39	0	67	0	1	7	24
Industrial Engineering	34418	188	34	4	22	36	1	38	1	0	3	0
Chemicals	25695	128	28	3	10	34	1	25	1	0	6	1
General Industrials	23487	82	16	4	8	16	0	17	0	1	8	2
Aerospace & Defence	23227	50	17	6	1	0	1	6	0	2	3	0
Health Care Equipment & Services	19048	86	48	6	8	8	0	6	0	0	0	0
Top 3 sectors	470853	829	332	37	28	83	0	128	20	7	23	50
Top 10 sectors	805876	1875	669	79	91	223	4	348	26	18	53	80
Total (2500)	946938	2500	769	127	130	318	6	507	32	22	70	89

Source: EU Industrial R&D Investment Scoreboard (2019); Centre for Technology, Innovation and Economic Research (CTIER)

Note: Figures in euros were converted to dollars using the EUR-USD exchange rate of 1.15 as at 31 December 2018 and as mentioned in the EU Industrial R&D Investment Scoreboard

that medical devices meet certain regulatory and quality standards. In her FY2021 budget speech, Finance Minister Nirmala Sitharaman had announced a scheme for the electronics sector, and had said that 'with suitable modifications' the electronics scheme could be adapted to manufacture medical devices. In the current tough fiscal environment that India finds itself in, where the central government's fiscal deficit is expected to widen significantly given its COVID related spending, focusing resources on medical devices would perhaps be a more prudent way to grow the electronics sector too.

Much more however needs to be done to develop a successful industrial and innovation policy around medical devices that complements the steps that have already been taken. For instance, although the FY2021 budget speech mentioned setting up technology clusters that would have test beds and small scale manufacturing facilities, there would need to be dedicated facilities that cater to medical device manufacturers. Device manufacturers have often lamented the lack of sufficient testing and test bed facilities, as well as the lack of access to existing testing facilities especially for smaller firms and startups. Providing access to testing facilities at some of the top public universities would provide much needed support to startups in this sector. Ensuring sufficient funding support at critical stages of the development of devices would be important, and the role industry associations would be essential here in connecting smaller innovative firms with larger firms. The support from larger firms and the government could be in various forms that include guidance as well as financial support, be it towards filing of patents for example or when devices require FDA, CE and other regulatory approvals. Certain policies would need to be revisited. The government may need to consider removing or lowering import duties on electronics components – the duties are often a barrier to lowering the cost of innovative devices. The government may also need to revisit the health cess on the import of medical devices announced in the FY2021 budget. Apart from making technology imports that India could benefit from more expensive, it is unclear whether having a cess like this will actually promote the manufacturing of quality innovative devices in India. The training of public officials would need to be an essential component of this strategy around medical devices, especially with respect to public procurement. Ensuring that those framing procurement rules are able to focus on the functionality of the devices rather than specific parts without compromising on the quality and standards of a device, would

spur greater innovation in this sector. Lastly, both the government as well as industry associations would need to work together to create a brand around India's medical device innovations and take these innovations overseas.

■ **In conclusion**

Policy makers should build on the learnings from the mission mode response that saw industry, academia and government come together to tackle the COVID-19 crisis. India needs a smart specialisation strategy around medical devices to build on its competitive strengths in the pharmaceutical & biotechnology and software & computer services industry. Re-thinking economic policy with technology at its core, one that pushes for technology deepening and diversification in a sequenced manner will help sustain India's economic recovery.

■ References

- Aiginger, K. and Rodrik D. (2020), "Rebirth of Industrial Policy and an Agenda for the Twenty-First Century", *Journal of Industry, Competition and Trade*, 189-207
- BI India Bureau (2020), "These are the companies that are making Remdesivir in India", *Business Insider India*, available at <https://www.businessinsider.in/science/health/news/these-are-the-companies-that-are-making-remdesivir-in-india/articleshow/78030739.cms>, accessed on 5 October 2020
- Budget Speeches, Ministry of Finance, Government of India, "Budget 2020-2021, Speech of Nirmala Sitharaman, Minister of Finance, February 1, 2020", available at <https://www.indiabudget.gov.in/doc/bspeech/bs202021.pdf>, accessed on 1 December 2020
- Central Drugs Standard Control Organization, Ministry of Health & Family Welfare, Government of India, Gazette Notifications, "S.O. 648(E) dated 11.02.2020_ Medical Device Definition" available at https://cdsco.gov.in/opencms/opencms/system/modules/CDSCO.WEB/elements/download_file_division.jsp?num_id=NTU00A=&num_id=NTU00A=&num_id=NTU00A=, accessed on 15 October 2020
- Central Drugs Standard Control Organization, Ministry of Health & Family Welfare, Government of India, Gazette Notifications, "G.S.R. 102(E)_dated 11.02.2020_ Registration of certain medical devices" available at https://cdsco.gov.in/opencms/opencms/system/modules/CDSCO.WEB/elements/download_file_division.jsp?num_id=NTU00Q=&num_id=NTU00Q=&num_id=NTU00Q=, accessed on 15 October 2020
- Chandna, Himani (2020), "Modi govt to allow PPE, ventilator exports as Indian companies are mass-producing them now", *ThePrint*, available at <https://theprint.in/health/modi-govt-to-allow-ppe-ventilator-exports-as-indian-companies-are-mass-producing-them-now/447460/>, accessed on 15 October 2020
- Chatterji, Saubhadra (2020), "Polio, BCG infra to power vaccine plan", *Hindustan Times*, available at <https://www.hindustantimes.com/india-news/polio-bcg-infra-to-power-vaccine-plan/story-04qY08wawfaQyIWPr3AGBN.html>, accessed on 1 December 2020
- Chitravanshi, Ruchika (2020), "Coronavirus test kits get cheaper but labs yet to pass on benefit", *Business Standard*, available at https://www.business-standard.com/article/current-affairs/coronavirus-test-kits-get-cheaper-but-labs-yet-to-pass-on-benefit-120100300046_1.html, accessed on 3 October 2020
- DH Web Desk (2020), "How Indian cold chain companies are gearing up to deliver Covid-19 vaccines", *Deccan Herald*, available at <https://www.deccanherald.com/business/business-news/how-indian-cold-chain-companies-are-gearing-up-to-deliver-covid-19-vaccines-891242.html>, accessed on 5 October 2020
- Ghosh, Abantika (2020) "Modi govt's 11 Covid empowered panels now replaced by six larger groups", *ThePrint*, available at <https://theprint.in/india/governance/modi-govts-11-covid-empowered-panels-now-replaced-by-six-larger-groups/502802/>, accessed on 10 October 2020
- Jaipuria, Timsy (2020), "Coronavirus drug: Government expects production of Remdesivir to more than double next month", *CNBCTV18*, available at <https://www.cnbctv18.com/healthcare/coronavirus-drug-government-expects-remdesivir-production-to-increase-more-than-twice-next-month-6471771.htm>, accessed on 5 October 2020
- Mani, S. and Nabar, J. (2020), "Newly Formed Empowered 'Technology Group' and COVID-19", *Economic and Political Weekly*, Vol 55, Issue No 42
- Mazzucato, Mariana (2016), "From market fixing to market-creating: a new framework for innovation policy", *Industry and Innovation*, Vol 23, Issue 2, 140-156
- Nabar, J., Reddy, K., Singhania, D., Sasidharan, S., "A new strategy is needed to rejuvenate India's healthcare sector", *Indian Express*, available at <https://indianexpress.com/article/opinion/indias-healthcare-sector-coronavirus-covid-19-6420642/>, accessed on 21 May 2020
- Nath, Rajiv (2020), "Budget 2020: Will FM Nirmala Sitharaman address Indian medical device industry's Woes?", *Business Today*, available at <https://www.businesstoday.in/union-budget-2020/columns/budget-2020-fm-nirmala-sitharaman-indian-medical-device-industry-woes-imports-healthcare/story/394474.html>, accessed on 1 October 2020

Organisation for Economic Co-operation and Development (2013), "Innovation-driven Growth in Regions: The Role of Smart Specialisation", available at <http://www.oecd.org/sti/inno/smart-specialisation.pdf>, accessed on 1 October 2020

Porecha, Maitri (2020), "11% of India's medical devices imports are from China", The Hindu BusinessLine, available at <https://www.thehindubusinessline.com/economy/11-of-indias-medical-devices-imports-are-from-china/article31870055.ece>, accessed on 1 July 2020

Seth, Dilasha (2020), "Govt kickstarts Budget-making exercise; health outlay may get 50% boost", Business Standard, accessed on 23 November 2020 (https://www.business-standard.com/article/economy-policy/govt-kickstarts-budget-making-exercise-health-outlay-may-get-50-boost-120112200762_1.html)

Sheriff, Kaunain (2020), "From lack of beds to rise in poverty, House panel flags Covid concerns", Indian Express, available at <https://indianexpress.com/article/india/from-lack-of-beds-to-rise-in-poverty-house-panel-flags-covid-concerns-7060720/>, accessed on 24 November 2020

't Hoen, Ellen (2020), "COVID-19 Crisis and WTO: Why India and South Africa's Proposal on Intellectual Property is Important", The Wire, available at <https://thewire.in/law/covid-19-crisis-wto-intellectual-property-vaccine-public-health>, accessed on 15 October 2020

Times News Network (2020), "US, EU block India's fight for IPR waiver for Covid drugs", The Times of India, available at <https://timesofindia.indiatimes.com/india/us-eu-block-indias-fight-for-ipr-waiver-for-covid-drugs/articleshow/78727904.cms?from=mdr>, accessed on 20 October 2020

World Health Organisation (2020), "WHO recommends against the use of remdesivir in COVID-19 patients", Newsroom, available at <https://www.who.int/news-room/feature-stories/detail/who-recommends-against-the-use-of-remdesivir-in-covid-19-patients>, accessed on 22 November 2020

