Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company’s public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
COVID-19 will affect the world for much longer than previously thought. An effective vaccine or treatment may be months away. Moreover, concerns about short-lived immune responses and the possibility of mutations means that we may have to live with the virus for years (Walker, Whittaker, & Watson, 2020, Kissler, Tedijanto, Goldstein, Grad, & Lipsitch, 2020). We suggest an adaptive strategy for cost-effective scaling up in a context of governance constraints, which can be applied to developing countries, drawing on emerging experiences.

Several months into the crisis, the basic interventions required to tackle the crisis are known. Fig. 1 summarizes the critical components of an integrated response. Saving the greatest number of lives requires simultaneously determining the most feasible and effective set of lockdown strategies and health responses, then identifying the organizations that can deliver and scale up each component of the response most effectively and at the lowest cost (Khan & Roy, 2020a). ‘How to deliver’ is as important a question as ‘what to deliver’ and the two have to be jointly determined.

These are not just health system questions, but also governance and capability question as health systems in developing countries are constrained by capacity, governance and corruption issues (Hutchinson, Balabanova, & McKee, 2019; Molina, 2016; Savedoff & Hussmann, 2006; Lewis, 2006). Effective supply-side responses will require innovative arrangements of bringing together unconventional delivery agencies to deliver appropriate segments of the response. In many countries, such networks have emerged supporting the existing health systems. The challenge is to devise ways of assessing the effectiveness of different delivery networks in a transparent way and enable better scaling-up.

Developing countries have responded with a variety of delivery responses—sometimes spontaneous—involving not just the public health system but also private sector hospitals, NGOs and companies. These responses need to be quality-controlled and coordinated to be effective, so the role of coordination agencies or their absence has been critical. If multiple agencies have to be comparatively assessed, redundancy has to be built in at the outset, with several networks providing similar response components. This provides a feasible way of identifying the cheapest way of delivering each component at a high-enough quality (Khan & Roy, 2020b) (see Fig 2).

Developing countries like Bangladesh or many states within India have not been very successful in enforcing lockdowns or delivering interventions at various levels. Weak centralized systems struggled in communicating the behaviour changes required for social distancing and lockdowns or delivering the required treatments at low cost or at scale. Rapid scaling up of health responses in vertically organized systems with significant capacity, governance and corruption constraints typically resulted in sharp rises in delivery costs or failed to deliver entirely. The cost of interventions is not just its notional market price but also the leakages...
that happen in procurement and simply through mismanagement (Barkat & Islam, 2001). Responses have been more effective and affordable when delivery networks were horizontally coordinated by catalyst organizations, involving agencies in the public, private and NGO sectors (Hindu, 2020). These horizontal networks need to cooperate with, but are different from and operate parallel to, the public health system. If multiple horizontal networks are identified and their performance compared for each response component, it becomes possible to identify the fastest and most cost-effective scaleup strategy. There are examples of how public health interventions were scaled up using various horizontal networks even in fragile contexts like Somalia, Afghanistan and Gaza (Cooley & Papoulidis, 2017).

In this approach, we need to ensure that effective coordination agencies are identified, either in government or NGOs that can take charge of maintaining oversight and reporting on outcomes in each network so that there is transparency. Some examples already exist such as the Brihanmumbai (Greater Mumbai) Municipal Corporation (BMC) in Dharavi, the self-help group Kudumbashree in the Indian state of Kerala, and the government of Ghana. Each of these highlight how local enforcement contexts were utilised to deliver effective treatment responses.

BMC’s proactive engagement in Dharavi, one of Asia’s largest slums – where it liaised with local private doctors and community workers for intensive surveillance and screening—has been credited with keeping the case load relatively low. The Kudumbashree ‘model’ of women-led community networks in Kerala monitored elderly and vulnerable citizens in quarantine for everyday and medical needs. In Ghana the government worked with a private drone company to deliver test samples while providing loans to local manufacturers to produce personal protective equipment. In countries which have a rich tradition of social self-governance an adaptive and integrated delivery mechanism would greatly enhance treatment response.

**Funding**

Khan, Matin, Roy, and Rabbani are part of the SOAS Anti-Corruption Evidence (ACE) research consortium funded by UK aid from the UK Government as per contract [P0 7073]. Chowdhury’s research is funded by UK Research and Innovation. The views presented in this article are those of the author(s) and do not necessarily reflect the UK government’s official policies or the views of SOAS-ACE or other partner organizations. For more information on SOAS-ACE visit www.ace.soas.ac.uk.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**References**

Barkat, A., & Islam, K. (2001). Government-NGO collaboration in Health and Population Sector Programme. Dhaka: University Research Corporation (Bangladesh).

Cooley, L., & Papoulidis, J. (2017). Tipping the scales: Shifting from projects to scalable solutions in fragile states. *Development, 60*, 190–196. https://doi.org/10.1057/s41301-018-0155-8.

Hutchinson, E., Balabanova, D., & McKee, M. (2019). We need to talk about corruption in health systems. *International Journal of Health Policy and Management, 8*(4), 191–194. https://doi.org/10.15171/ijhpm.2018.123.

Khan, Mushtaq, & Roy, Pallavi (2020a). COVID-19: Locking in solutions while in lockdown. *SOAS University of London: Anti-Corruption Evidence (ACE) Research Consortium, Briefing Paper 8*. London: SOAS University of London.
Khan, Mushtaq, & Roy, Pallavi (2020b). Rethinking anti-corruption for COVID-19. Oxfam.

Kissler, S. M., Tedijanto, C., Goldstein, E., Grad, H. Y., & Lipsitch, M. (2020). Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period. Science, 368(6493), 860–868. https://doi.org/10.1126/science.abb5793.

Lewis, M. (2006). Governance and corruption in public health care systems. Working Paper 782006. Center for Global Development.

Molina, E. et al (2016). Community monitoring interventions to curb corruption and increase access and quality of service delivery in low-and middle-income countries: A systematic review. Campbell Systematic Reviews, 2016, 12.

Savedoff, W. D., & Hussmann, K. (2006). Why are health systems prone to corruption. In Global Corruption Report (pp. 4–16).

The Hindu. (2020). How Dharavi Curbed the Spread of Covid-19. Retrieved from <https://www.thehindu.com/news/cities/mumbai/how-dharavi-curbed-the-spread-of-covid-19/article32009506.ece>. (Accessed August 20 2020).

Walker, P. G., Whittaker, C., Watson, O., et al (2020). In The global impact of COVID-19 and strategies for mitigation and suppression. https://doi.org/10.25561/77735.