

## Contextualising geographical vulnerability to COVID-19 in India



With over 697 000 confirmed cases and 19 700 deaths as of July 6, 2020, India accounts for around 6% of global COVID-19 infections and 3.5% of COVID-19-attributable mortality, and is ranked third worldwide in terms of the number of infections. Although the proportion of the total population infected is low compared with other countries—0.05% versus 0.87% in USA, 0.73% in Brazil, 0.46% in Russia, and 0.4% in Italy<sup>1</sup>—India has a high risk of community transmission because of crowded living conditions, congested cities, a large slum-dwelling population, poor health-care facilities, low educational attainment, and high levels of poverty. Deaths attributable to COVID-19 are largely premature, with around half of deaths occurring in people aged 40–64 years.<sup>2</sup> A relatively young age structure (less than 5% of the population is older than 70 years), high levels of comorbidities, and poor health-care facilities are leading to high premature mortality due to COVID-19 in India.<sup>3</sup> The disease has begun to spread from large cities to smaller towns and rural areas, and if the disease spreads in proportions similar to in Mumbai or Delhi, the adverse health effects are likely to be severe for poorer people and those living in poorer regions of the country.

In this context, Rajib Acharya and Akash Porwal report a timely and policy-relevant Article in *The Lancet Global Health*,<sup>4</sup> concerning the development of a vulnerability index for managing and responding to COVID-19 in India. The authors used available data from reliable sources and extended the concept of vulnerability to microregions (districts) in the context of the COVID-19 pandemic.<sup>5</sup> They adopted the methodology of social vulnerability indices that has been previously used in related literature.<sup>6</sup> Acharya and Porwal's study makes three important contributions.<sup>4</sup> First, the study identified five key domains and 15 indicators to measure spatial vulnerability to the COVID-19 epidemic in India. The five domains—social, demographic, economic, health, and epidemiological—are unique and represent multiple facets of vulnerability that can be replicated in low-income and middle-income countries. Second, the study found a high association between housing and hygiene and the availability of health care with overall vulnerability at

state and district levels. Third, the study documented large variations in the vulnerability index across the 640 districts of India.

Whether a vulnerability index can be a good predictor of COVID-19 infection in microregions (districts) remains unclear. Although the authors noted a reasonable association between the vulnerability index and infections at the state level, they did not find a clear association at the district level. Besides, the causal association of the vulnerability index with outcome variables (case-fatality ratio or similar variable) requires further investigation.

Research on the COVID-19 epidemic in India has focused more on estimation, projection, and clinical management, and less on vulnerability and health systems.<sup>7–9</sup> To our knowledge, Acharya and Porwal present the first attempt to investigate vulnerability as a consequence of COVID-19 infection with reasonable precision.<sup>4</sup> Programmatically, the central and state Indian Governments have used various outcome variables, including the number of infected cases, case-fatality ratio, and recovery rate in managing and controlling the epidemic. Vulnerable districts within each state might be prioritised for programmatic intervention.

The vulnerability index has been prescribed as a risk of consequences of COVID-19 infection across geographies in India. The higher the index value, the higher the impact of COVID-19 on mortality, morbidity, and potentially catastrophic health spending in the region. Control and allocation of resources from central and state governments is often difficult for policy makers. Based on the findings of this study,<sup>4</sup> it might be appropriate to allocate resources for control and mitigation of the COVID-19 pandemic in districts of India. The findings further suggest that public investment in health to improve health facilities should be augmented and private health centres should be involved with care of patients with COVID-19. Many highly vulnerable districts in India are in poor states that have a high vulnerability index value for non-availability of health care. Public health investment in health infrastructure, manpower, and testing facilities could save patients who are critically ill in such districts.

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Furthermore, making the public aware of, through mass media, the importance of social distancing, hygienic practices, and careful care of older people and those with comorbidities could help reduce infections and fatalities.

Although Acharya and Porwal outlined the limitations of computing subdistrict level estimates and data periodicity,<sup>4</sup> I believe their estimates for the epidemiological and health care domain were underestimated. For example, in the epidemiological domain, there are 37 districts with less than 30 cases for men aged 40–54 years, which might have affected the estimates. Such an exercise at a state or regional (group of districts) level could be undertaken using data from National Sample Survey or the Longitudinal Ageing Study in India. The predictions that poorer and more crowded regions will have larger adverse consequences from COVID-19 need further validation with data from the poorer districts of the worst affected states. Finally, in addition to ranking districts across the country, districts within each state should also be ranked to help the state government in resource allocation and management.

I declare no competing interests.

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- 1 Worldometer. COVID-19 coronavirus pandemic. <https://www.worldometers.info/coronavirus/> (accessed July 6, 2020).
- 2 Mohanty SK, Sahoo U, Mishra US, Dubey M. Age pattern of premature mortality under varying scenarios of COVID-19 infection in India. *medRxiv* 2020; published online June 12. <https://doi.org/10.1101/2020.06.11.20128587> (preprint).
- 3 Mudur GS. COVID-19 eats away at India's workforce. June 20, 2020. *The Telegraph* online. <https://www.telegraphindia.com/india/coronavirus-outbreak-covid-19-eats-away-at-indias-workforce/cid/1782262> (accessed July 8, 2020).
- 4 Acharya R, Porwal A. A vulnerability index for the management of and response to the COVID-19 epidemic in India: an ecological study. *Lancet Glob Health* 2020; published online July 16. [https://doi.org/10.1016/S2214-109X\(20\)30300-4](https://doi.org/10.1016/S2214-109X(20)30300-4).
- 5 The Lancet. Redefining vulnerability in the era of COVID-19. *Lancet* 2020; **395**: 1089.
- 6 Flanagan BE, Gregory EW, Hallisey EJ, Heitgerd JL, Lewis B. A social vulnerability index for disaster management. *J Homel Secur Emerg Manag* 2011; **8**: 1.
- 7 Khetrpal S, Bhatia R. Impact of COVID-19 pandemic on health system and Sustainable Development Goal 3. *Indian J Med Res* 2020; **151**: 395–99.
- 8 Singh SK, Aditi. IIPS Analytical Series on COVID-9: paper 6: socio-economic vulnerabilities to COVID-19 in India: swimming against the tide. 2020. [https://iipsindia.ac.in/sites/default/files/iips\\_coivd19\\_sevi.pdf](https://iipsindia.ac.in/sites/default/files/iips_coivd19_sevi.pdf) (accessed July 8, 2020).
- 9 Varghese GM, John R, Manesh A, Karthik R, Abraham OC. Clinical management of COVID-19. *Indian J Med Res* 2020; **151**: 401–10.