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collaboration, and competition. Intersectoral and centre-state convergence addresses education, skills development, financial inclusion, water, air, infrastructure, and other determinants of health. Apart from state-wise and district-wise differences, another source of huge variation is urban slums. The mortality indicators in urban slums are even worse than in rural areas and they have their own unique set of problems.<sup>8,9</sup> The growing inequalities shown in this study<sup>1</sup> between 2000 and 2017, against a global aim of equity, are of concern and reflect the widening gap between the rich and the poor.

Finally, the estimates of the causes of neonatal deaths in the country need to be more robust for good planning. The study authors point out the limitations of verbal autopsy methods.<sup>1</sup> However, the medical certification of cause of death is not always credible, given the expertise of medical officers in the districts with limited laboratory support.<sup>10</sup>

The authors make a strong case for local implementation and provide guidance to address gaps. In this direction, the Indian Government has launched programmes to improve nutritional outcomes for children, pregnant women, and lactating mothers; clean water and sanitation; and hygiene in public health facilities. With local input and planning, both U5MR and NMR can be brought down.

We declare no competing interests.

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For the **nutritional outcomes programme** see <https://niti.gov.in/poshan-abhiyaan>

For the **clean water and sanitation programme** see <https://swachhbiharmission.gov.in>

For the **guidelines for public health facilities** see [https://www.nhp.gov.in/kayakalp-swacchta-guidelines-for-public-health-facilities\\_pg](https://www.nhp.gov.in/kayakalp-swacchta-guidelines-for-public-health-facilities_pg)

## Global coordination on cross-border travel and trade measures crucial to COVID-19 response



When WHO declared the COVID-19 outbreak a Public Health Emergency of International Concern (PHEIC) on Jan 30, 2020, under the provisions of the International Health Regulations (2005) (IHR), it recommended against “any travel or trade restriction”.<sup>1</sup> The recommendation was based on data available at the time, evidence from previous outbreaks, and principles underpinning the IHR. It formed an important part of WHO’s messaging about how states could effectively respond in a coordinated way. Instead, over the following months, according to WHO, 194 countries adopted some form of cross-border measure—eg, travel restrictions, visa restrictions, border closures, among others—with little reproach from WHO or other actors in the international community.<sup>2</sup> This response is a sharp increase from at most 25% of member

states that imposed trade and travel restrictions during the 2009 H1N1 influenza pandemic and the 2013–16 outbreak of Ebola virus disease in west Africa.<sup>3</sup> Indeed, WHO’s recommendation against measures such as travel restrictions and border closures became a point of criticism of the organisation’s role at the early stages of the COVID-19 pandemic.<sup>4</sup>

The universal adoption of cross-border measures raises fundamental questions about what coordination means during a pandemic, and what role WHO has in facilitating this. Coordinated action among states in an interconnected world underpins effective prevention, detection, and control of disease outbreaks across countries.<sup>5</sup> As parties to the IHR, governments agree that coordination is important to ensure that measures

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**Panel: Measures to control cross-border trade and travel related to disease outbreaks**

**International travel**

- Travel warning
- Travel advisory
- Suspend transportation (land, air, and sea)
- Visa requirement or refusal
- Expedite entry of selected foreign nationals (eg, farm labourers, health workers)
- Restrict entry of selected foreign nationals on the basis of nationality, travel history, or health status
- Close national borders in part or whole

**International trade**

- Restrict import of specific goods from selected country
- Expedite import of selected goods (eg, ventilators, active ingredients for drug manufacturing, personal protective equipment)
- Restrict export of personal protective equipment
- Impose technical requirements for imported goods (eg, labelling, certification)

**Entry and exit controls at national borders**

- Compulsory temperature measurement
- Compulsory questionnaire (eg, symptoms, travel history, contact tracing)
- Voluntary or compulsory quarantine upon entry
- Voluntary or compulsory testing upon entry
- Distribution of public health information at ports of entry
- Mandatory certification (eg, vaccination, disease free status)
- Vector control and surveillance (eg, spraying at borders or on airplanes)

do not unnecessarily disrupt international trade and travel. Thus, during major disease outbreaks, part of WHO's role is to provide evidence-informed guidance on cross-border measures.

A wider range of cross-border measures have been adopted by countries during the COVID-19 pandemic than in past disease outbreaks. Not all these measures fall under the IHR, but patterns of adoption point to several knowledge gaps. First, what measures have been adopted over time and space not only by member states but also by commercial companies such as airlines and cruise ships? Companies do not fall under the remit of the IHR, but their actions have had clear consequences. There is a need to track the full range of cross-border measures (panel) adopted during the COVID-19 pandemic, the specific requirements they impose, and, for member states, consistency with the IHR.

Second, the impacts of cross-border measures are not well understood. From a public health perspective, research on past outbreaks—and the even more limited research that exists on cross-border measures during COVID-19—has focused on the impact of travel restrictions on the prevention of disease transmission, for which evidence is mixed. Some studies suggest

such restrictions can delay disease spread,<sup>6</sup> whereas other research suggests negligible effects on the overall number of cases.<sup>7</sup> However, studies have not compared effectiveness of cross-border measures across outbreaks caused by different pathogens and focus only on containment but not the mitigation or suppression phases of an outbreak.<sup>6,7</sup> Other studies suggest certain cross-border measures are counterproductive because they discourage disclosure of potentially relevant information by individuals during screening and by governments seeking to avoid being the target of restrictions.<sup>8</sup> Forced quarantines, visa restrictions, and flight cancellations could hinder the movement of health workers and essential supplies.<sup>9</sup> Importantly, cross-border measures have economic, social, legal, and ethical impacts that can be inequitably experienced if there is insufficient attention to such impacts. Protectionist trade and travel restrictions might maintain public and investor confidence in some affected countries, but could contribute to economic strain and poorer health outcomes in other affected countries,<sup>10</sup> further hindering response efforts. To date, the extent to which these effects vary in terms of the public health threat and the context in which they occur have not been studied. Probing these effects across different stages of the pandemic is important since COVID-19—and the related cross-border measures—will be with us in some form for longer than other major outbreaks of the recent past.

Third, beyond public health rationales, explanations for why governments adopt travel restrictions are largely limited to economic interests and political pressure to “do something”. However, decision making behind the unprecedented cross-border measures adopted during this pandemic needs fuller explanation. Complex considerations could be at play: evolving knowledge about COVID-19; uncertainty about the source of the outbreak or biases about the origin; insufficient clarity of WHO recommendations;<sup>11</sup> timing of the PHEIC declaration; unknown efficacy of specific measures; lack of trust in public health officials; geopolitical dynamics; and epidemiological trends over time. Relatedly, the question of why, when, and how governments decide to lift cross-border measures is largely unexplored in existing research.<sup>12</sup> During the COVID-19 pandemic, most policy attention so far has been on lifting domestic restrictions, but easing cross-border measures—and possibly reintroducing them

if there are subsequent waves of new cases—will pose similar challenges for decision makers. Indeed, recent discussion of an Australia–New Zealand “travel bubble”<sup>13</sup> is one example of the coordination challenge of lifting cross-border restrictions. Protecting public health while minimising unnecessary interference with travel and trade has been a core principle of the IHR since adoption of the International Sanitary Regulations by WHO member states in 1951. This longstanding goal, which member states collectively supported by signing the revised IHR in 2005, should not be abandoned lightly.<sup>14</sup> Instead, a comprehensive accounting is needed of what cross-border measures have been adopted during the COVID-19 and past outbreaks, how these measures impact on public health and wider society, and what factors influence decision making. Such information is required to enable evidence-based, real-time decisions on adopting and lifting cross-border measures to mitigate harm during COVID-19 and future outbreaks.

KL was a member of two donor-funded reviews of WHO in 1995 and 1997, was Co-Director of the WHO Collaborating Centre on Global Change and Health in 2005–10, and chaired the WHO Expert Group on Globalization, Trade and Health. KL has previously received funding from WHO to conduct research on global health governance and global tobacco control, and review evidence on the impacts of globalisation and infectious diseases. CZW was a member of a WHO guideline development group and on a technical consultation in 2019. AK-S served as a volunteer with WHO in 2018 and as a member of a WHO guideline development group and on two WHO technical consultations in 2019. The authors are funded by the New Frontiers in Research Fund (grant NFRFR-2019-00009) through an operating grant awarded under the Canadian Institutes of Health Research Rapid Research Funding Opportunity. The funders were not involved in the writing of this Comment. We declare no other competing interests.

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## COVID-19 immunity passports and vaccination certificates: scientific, equitable, and legal challenges



Many governments are looking for paths out of restrictive physical distancing measures imposed to control the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). With a potential vaccine against coronavirus disease 2019 (COVID-19) many months away,<sup>1</sup> one proposal that

some governments have suggested, including Chile, Germany, Italy, the UK, and the USA,<sup>2</sup> is the use of immunity passports—ie, digital or physical documents that certify an individual has been infected and is purportedly immune to SARS-CoV-2. Individuals in possession of an immunity passport could be exempt

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