# Comment

**Health workers check the temperatures of people in the Dharavi slum in Mumbai, India, as part of coronavirus screening.**

# Cities: build networks and share plans to emerge stronger from COVID-19

**Xuemei Bai, Harini Nagendra, Peijun Shi & Haiyan Liu**

Responses to the pandemic in India's slums, Brazil's favelas and Africa's marketplaces show that networks play a crucial part in making cities more resilient. Let's enhance and empower them.

Cities are epicentres of the COVID-19 pandemic. From Wuhan to Madrid to São Paulo, the scenes have been grim — wards bursting with patients, queues of refrigerated lorries acting as temporary mortuaries, food-bank lines snaking around empty streets. At the same time, people and animals have thronged streets and parks, while carbon emissions and smog levels have plummeted from New Mexico to Delhi.

COVID-19 is still running its course. The immediate aftershocks — job losses, poverty, food scarcity — need addressing urgently. But much has been learnt. The experience is already motivating change.

In May, mayors from 38 of the world's largest cities — including Hong Kong, Los Angeles in California and Durban in South Africa — announced a set of principles for redesigning their metropolises to be more sustainable and equitable. Combating climate change is one priority of the Global Mayors COVID-19 Recovery Task Force. Milan, Paris, Bogota

# Comment

and Barcelona, for example, will close areas to motorized traffic, expand pavements and increase cycling lanes.

Initiatives such as these are welcome. But cities need an extensive rethink of how they are governed and run. They need to strengthen leadership and health-care systems, improve how they communicate, source more food, goods and services locally, give a greater priority to nature and combat inequalities.

One action, above all — strengthening and extending networks within and between cities — will make urban regions more resilient to future pandemics and other crises such as climate change[1,2]. By building links now, cities will be better placed to act quickly and be able to give or receive help from others when another disaster strikes.

## Learn lessons

Cities' scorecards on COVID-19 are mixed. Although the picture is evolving, they already tell us a lot about what works and what doesn't.

First, strong leadership and governance at all levels are crucial to ensure rapid responses[3,4]. Well-run cities such as Hanoi in Vietnam were able to avoid major outbreaks at the outset by rapidly restricting travel and scaling up testing, tracing and quarantining. Similarly, Thiruvananthapuram (Trivandrum), the capital of the Indian state of Kerala with an estimated population of more than 2.5 million, has one of the lowest infection and death rates in the country — just over 4,000 confirmed cases and 12 deaths by 1 August — despite having thousands of returning international students and workers. By contrast, places such as São Paulo in Brazil, Delhi and New York City that reacted slowly or ineffectively ended up with overstretched hospitals and hundreds of times more deaths.

Timely, reliable, accurate and science-based information is crucial. Individuals need to know why and how they should maintain a social distance, wear masks and quarantine. For instance, Bangalore in India publishes a daily dashboard and maps of newly diagnosed infections used for local tracing (https://covid19.bbmpgov.in).

Yet confusion, contradiction and underestimation are more often the norm. The Chinese city of Wuhan has been criticized for being slow in responding to the emergence of the virus. Lack of notice of lockdowns in India left millions of migrant workers scrambling to arrange transport home in March and May.

Some cities have manipulated information for political gains or to avoid social instability. Death rates were under-reported initially or delayed in New York City, St Petersburg, Milan and Lahore, for example. Inaccurate information can seed unrest. For instance, in March, rumours of contagious evacuees returning from China sparked a riot in the Ukrainian town of Novi Sanzhary.

Misinformation is rife, even about well-established issues such as wearing face masks to block the airborne spread of the disease. Asian cities including Hong Kong, Tokyo, Beijing and Ho Chi Minh City, some of which experienced or had prepared for an epidemic of severe acute respiratory syndrome (SARS) in 2003, soon mandated masks. Western cities such as Milan, New York City and Barcelona dithered; many still don't enforce the use of face masks. Multiple languages can be a barrier to communication. In Lusaka in Zambia, a nun and social worker called Sister Astridah Banda conducts a live radio show about COVID-19 in seven local languages to answer people's questions.

Even the richest cities lack medical facilities that are equipped to cope with epidemics. Few large hospitals are designed to isolate hundreds of people with infectious diseases. For example, only 3 of Wuhan's 90 hospitals were initially designated as suitable for people with COVID-19; by April, 65 were. Mobile and large temporary wards were quickly constructed to treat thousands more people.
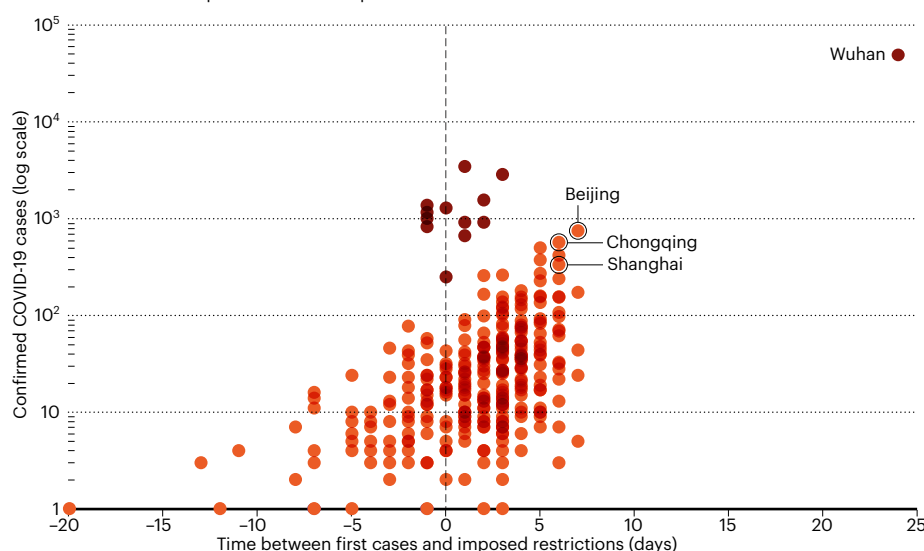
Measures need to be taken to minimize deaths from other acute or chronic causes. Hospitals that were unequipped to handle the pandemic were reluctant to take in these patients out of fear of infection or legal consequences. In response, Taipei in Taiwan has created telephone hotlines where quarantined

## URBAN RESPONSES

Cities around the world have so far had different experiences of COVID-19 (by 1 August 2020). Lessons are emerging.
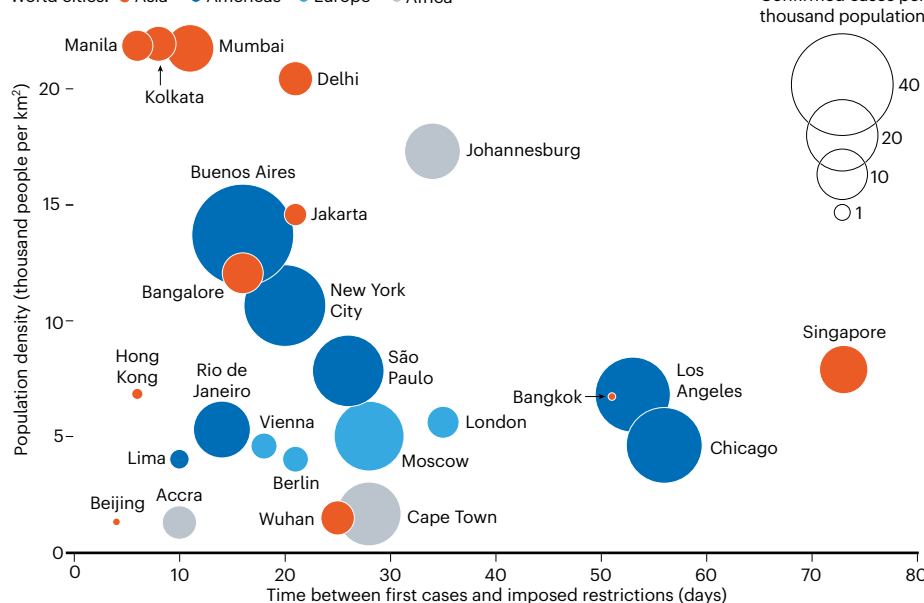
### 1. Act fast to limit spread

Chinese cities: ● Hubei province ● Other provinces



### 2. Density has little impact

World cities: ● Asia ● Americas ● Europe ● Africa

Confirmed cases per thousand population

individuals can call 'disease prevention taxis' to take them for routine treatments. Buenos Aires runs a WhatsApp chatbot called Boti to answer public queries and refer cases to medical professionals.

Technology is a mixed blessing. Yes, social media spreads information, but it can also amplify misinformation. Fact-checking and other sites have sprung up to combat it. For example, the social-media and messaging app WeChat and the microblogging website Weibo established platforms that connect hospitals, doctors, government and the media to provide trusted information and direct those in need to services; Weibo was widely used in Wuhan.

The Internet has enabled home working, online learning and shopping during lockdowns. Yet it also exacerbates inequality. Shopkeepers and bus drivers can't operate from home. Many people don't have smartphones or access to the Internet. For example, Indian migrant workers seeking to return home were required to fill out bewildering forms online in English, an unfamiliar language.

Contact-tracing apps have proved effective in slowing the spread of the disease. People's increased ease with using the apps makes it likely that other smart technologies will be rolled out. China, which gives individuals a QR barcode showing their risk on the basis of travel and contact history, is deploying technology for identifying and measuring the temperatures of people in public places. Japan is developing facial-recognition technology for people wearing masks. Such technologies heighten concerns of infringement and state and corporate control over individuals' rights.

COVID-19, like other diseases, disproportionately affects the urban poor and certain minority ethnic groups. In US cities, rates of infection and deaths are more than twice as high among people affected by poverty. Similar increased rates are found in Black or African American communities, and in Hispanic or Latinx communities, compared with those for white and Asian American groups; American Indian and Alaska Native groups experience hospitalization rates for COVID-19 that are five times higher than those of white, non-Hispanic groups (see go.nature.com/37fffny and go.nature.com/349uvhd). In slums such as Dharavi in Mumbai, India, 67% of households rely on community toilets, soap and clean water are scarce and physical distancing is impossible. Not surprisingly, by mid-July, 40–60% of people living in Mumbai's slums were infected. By contrast, the African cities of Kigali and Nairobi have set up public hand-washing stations in bus stations and markets.

Migrant workers have been badly affected. Governments rarely consider them in their planning, and they are invisible in censuses and surveys[5]. Singapore's infections spiralled among its migrant workers, many living in



A tailor makes face masks in a favela workshop in Belo Horizonte, Brazil.

cramped, unsanitary spaces; unlike other citizens, they weren't issued with face masks at the outset. In June, Germany saw an outbreak in a meat-packing plant staffed largely by migrant workers from eastern Europe. Across India, Africa and Latin America, millions of migrants were excluded from aid during lockdowns.

Ecology is another neglected factor in pandemic planning. Extending urban development into the surrounding countryside exposes residents to diseases. Some city dwellers who have a taste for wild meats might also be at increased risk of disease. In the United States, residents of suburbs near forests are more likely to contract Lyme disease, a tick-borne infection. Encroachments into African and Amazonian rainforests are hotspots for diseases such as Ebola. The COVID-19 pandemic has also stoked fears about nature itself. Residents of the Indian city of Mysore, for instance, cut down trees because they were worried about bats potentially transmitting COVID-19.

Food supply chains have been broken by the pandemic, resulting in higher prices, hunger and possible spread of disease. For instance, in June, Beijing had a spike of cases that originated in a food market handling frozen foods imported from overseas. However, the pandemic has increased people's interest in urban agriculture, which can enhance resilience to disasters. Half of the area of Havana is farmed by residents.

Berlin is seeing an upsurge in community growing. Grazing, fishing and foraging for wild greens are widespread in Indian and African cities.
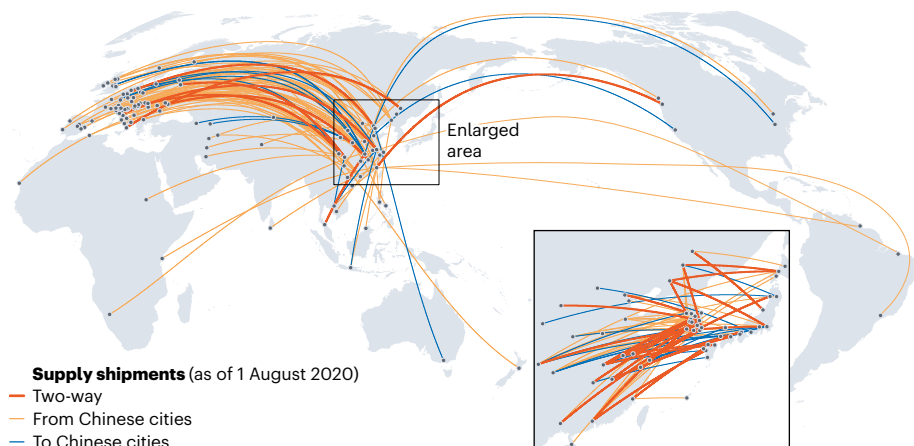
## Bust myths

Our understanding of how cities work needs to be improved as well. Too many researchers still adhere to myths around life in cities. For example, high-density urban living is often wrongly blamed for high death rates in urban disasters. Take New York City and Hong Kong. These cities have similar populations (8.4 million and 7.4 million people, respectively) and some of the largest residential densities in the world (New York City, for instance, has around 10,000 people per square kilometre). Yet New York City has seen more than 220,000 cases and around 19,000 deaths from COVID-19, many more than Hong Kong's 3,398 confirmed cases and 33 deaths (as of 1 August 2020). Density alone cannot explain such a drastic difference.

Timely action is much more important. For example, Chinese cities show a correlation between the number of confirmed cases and the time taken to restrict mobility after the first case of COVID-19 (Pearson's correlation 0.49, $P <0.001$); no correlation is found with density (see 'Urban responses'). A study across 900 US metropolitan counties finds the same result[6]. Early actions, such as citywide lockdown of public transport, entertainment venues and public gatherings,

# Comment

## HELPING EACH OTHER

Cities in China received protective gear and medical equipment at the start of the COVID-19 pandemic from their sister cities globally. As the virus spread, they later sent out much more aid than they initially received.



**Supply shipments** (as of 1 August 2020)
— Two-way
— From Chinese cities
— To Chinese cities

averted hundreds of thousands of infections in Wuhan's Hubei province[7].

### Mobilize networks

Where urban and government leadership fails, communities and other bodies step in. In Brazil, G10 Favelas, a network of community leaders across the ten largest informal settlements in the nation, is providing medical supplies and raising donations to hire private ambulances and health staff for residents. By late June, women in São Paulo's largest slum, Paraisopolis, had sewn more than 50,000 masks.

In Bangalore, Chennai, Mumbai and Delhi in India, networks of philanthropists, non-governmental organizations, government agencies and individuals provide food and personal protective equipment to clinical staff and city residents. They compile real-time maps of areas in need of relief to direct emergency help.

When Mumbai's private health system collapsed under the strain of COVID-19 infections, collaboration between the municipality and local low-cost private-health practitioners capped the virus's spread in the Dharavi slum.

Vietnamese cities have also forged connections with local clinicians and businesses. Within a month of the first cases, local manufacturers were producing affordable COVID-19 testing kits, allowing the number of testing stations to rise from 3 in January to 112 by the end of April nationwide.

Links developed during previous epidemics have proved useful. Kinshasa in the Democratic Republic of the Congo is repurposing infrastructure and staff trained to respond to Ebola outbreaks[8]. Seoul in South Korea is applying lessons from a 2015 outbreak of Middle East respiratory syndrome (MERS), including improved coordination, scale-up of testing and use of technology for contact tracing.

Connections between cities are another source of strength. Many cities in China received masks and protective gear from sister cities in South Korea, Japan and other countries. Once the Chinese cities had recovered, they reciprocated the assistance (see 'Helping each other'). People have crossed borders for treatment, for example between cities in Guangdong and Liaoning provinces in China, and from Italy to Germany.

Transfer of knowledge is also beneficial. In June, Beijing contained an outbreak by applying lessons from Wuhan: immediately disclosing information, tracing the contacts of 365,000 people and testing 2.95 million people in 11 days from the first confirmed case. Risks were assessed and measures tailored to individuals and districts to avoid locking down the whole city. Vaccine testing and medical trials of drugs also need cross-city coordination.

### Build resilience

We call for cities to develop 'networked functional resilience' by sharing and coordinating disaster risk plans and actions. Clusters of cities, as well as urban–rural and other diverse networks, that help each other will achieve greater resilience than one city working alone. There's a clear incentive — controlling one epicentre prevents spread to others. Stronger and deeper networks would also help to combat other hazards, such as climate change[2,9]. When one city is hit by a massive flood, heatwave or drought, other cities can quickly access channels to provide help.

Geographical proximity is helpful, and governments should mandate that neighbouring cities develop joint disaster- and risk-prevention mechanisms. International coalitions of cities such as ICLEI (a global network of local governments committed to sustainable development), C40 (a coalition of the world's megacities, focused on combating climate change) and 'sister cities' should encourage their members to do likewise, and stretch beyond their current focus of sharing information and learning[10,11]. The United Nations should take a lead in promoting such collaboration. The first step is to share each other's visions, strengths and constraints. Then develop mechanisms for sharing resources in an emergency. There are many challenges. Institutions and governance structures will be very different. But collaborations between cities can also be less political, swifter to respond and more pragmatic than those between countries.

Urban researchers need to look beyond single variables and grapple with the complexity of cities, as places where many factors interact. More attention needs to be paid to understanding the links between physical structure, urban processes, governing capacity and functional outcomes[12]. Researchers should explore the best governance and institutional arrangements for strengthening cooperation between cities. These include realistic mechanisms for allocating responsibilities and ensuring accountability, especially across national borders. Technology needs to be developed for integrating and sharing information. Neighbouring cities might share such platforms, for example to enable the speedy resumption of travel and economic interactions during and after this pandemic.

Cities have survived countless disasters throughout history, from wars to famines. COVID-19 now shows that cities must also learn, adapt and evolve — together.

### The authors

**Xuemei Bai** is a professor of urban environment and human ecology at the Fenner School of Environment & Society at the Australian National University, Canberra, Australia. **Harini Nagendra** is a professor of sustainability at Azim Premji University, Bangalore, India. **Peijun Shi** is a professor of geography at Beijing Normal University and Qinghai Normal University, China. **Haiyan Liu** is a researcher at Wuhan University and the Southern Marine Science and Engineering Guangdong Laboratory, Zhuhai, China.
e-mails: xuemei.bai@anu.edu.au;
spj@bnu.edu.cn; harini.nagendra@apu.edu.in

1. Bai, X. et al. Nature **555**, 23–25 (2018).
2. Rosenzweig, C. et al. Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network (Cambridge Univ. Press, 2018).
3. Ostrom, E. Glob. Environ. Change **20**, 550–557 (2010).
4. Shi, P. Int. J. Disaster Risk Sci. **3**, 139–146 (2012).
5. Nagendra, H., Bai, X., Brondizio, E. S. & Lwasa, S. Nature Sustain. **1**, 341–349 (2018).
6. Hamidi, S., Sabouri, S. & Ewing, R. J. Am. Plan. Assoc. https://doi.org/10.1080/01944363.2020.1777891 (2020).
7. Tian, H. et al. Science **368**, 638–642 (2020).
8. Nachega, J. B., Mbala-Kingebeni, P., Otshudiema, J., Zumla, A. & Tam-Fum, J.-J. M. Lancet Glob. Health **8**, e991–e992 (2020).
9. Guerreiro, S. B., Dawson, R. J., Kilsby, C., Lewis, E. & Ford, A. Environ. Res. Lett. **13**, 034009 (2018).
10. Acuto, M. Dialogues Hum. Geogr. **10**, 221–224 (2020).
11. Frantzeskaki, N., Buchel, S., Spork, C., Ludwig, K. & Kok, M. T. J. Ecol. Econ. **164**, 106350 (2019).
12. Bai, X. et al. Curr. Opin. Environ. Sustain. **23**, 69–78 (2016).