From China: hope and lessons for COVID-19 control

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Juanjuan Zhang and colleagues[1] use detailed, publicly available data to explore key epidemiological features of the coronavirus disease 2019 (COVID-19) pandemic in China. Outside the original epicentre of Hubei province, they found that the effective reproduction number dropped below the critical threshold of 1 by the end of January, 2020, for nine heavily affected Chinese provinces or cities. This finding suggests significant slowing of local transmission. Importantly, these reductions were achieved in a matter of weeks from the first signs of local transmission in most provinces. Although the true causal nature of these transmission reductions is not addressed in Zhang and colleagues' analyses, it is probably due to the strict government-imposed restrictions on movement of people and social gatherings, widespread symptom screening, testing and quarantine programmes, and the strong emphasis on personal behaviour change (eg, hand hygiene, mask use, and physical distancing) to reduce the risk of transmission. The authors also found, as others have shown,[2] that the mean incubation period and serial interval were of similar length (5·2 days [95% CI 1·8–12·4] and 5·1 days [1·3–11·6], respectively), suggesting an important role of transmission before or soon after symptoms have developed. Although this study has a number of limitations, it illustrates the power of rapid openly available data for providing important insights to guide complex policy decisions in the coming months.

The authors used detailed, publicly available line lists, epidemiological reports, and case and contact investigation results from across China. Although, in the past, China has been criticised for a lack of transparency related to epidemiological surveillance data, this rapid openness goes beyond what most countries are doing today.[3] Rapid analyses, including computational modelling efforts, are vital to assist decision makers in these largely uncharted waters; however, these analyses are only as good as their data. Our daily understanding of the pandemic is primarily based on the number of confirmed cases reported (eg, WHO daily reports and online dashboards[4]), which can only be interpreted with an understanding of who is being tested (eg, only severe cases) and laboratory capacity. To correct the epidemic curves, data on testing capacity and test eligibility criteria over time across the globe are urgently needed. Furthermore, insights to the frequency of asymptomatic and mildly symptomatic infections from individuals tested for the virus or antibody responses, irrespective of symptoms, will greatly improve real-time assessments.[5]

The interventions implemented throughout China include complete lockdown of cities, active case surveillance, rapid investments in increased testing capacity, isolation of cases, treatment of severe cases, quarantine of cases and high-risk groups, and behavioural risk-reduction strategies, such as the compulsory use of masks in the general population. The trajectory of the epidemic curves in China alone suggest that these measures—some of them extreme—might have led to substantial reductions in transmission as of late March, 2020. China made difficult decisions with complex trade-offs between economic and social consequences and acute health effects on the basis of little historical data. These decisions pave the way for other countries to design responses to COVID-19 on the basis of their experiences. The encouraging results from Zhang and colleagues' study provide hope that rapid control might be possible, although with high economic and social costs. Countries across the world are making some of the same policy decisions, effectively halting their economies in the hopes of avoiding a massive death toll, but such lockdowns cannot go on forever. In the search for a new sustainable normal, countries and municipalities will inevitably adopt a range of approaches adapted to local specificities in the coming months. Through open documentation of these varying policy choices and timelines, and real-time assessments of their effects, we can and must generate evidence to minimise the acute and long-term consequences of this pandemic.

We declare no competing interests.

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Modelling COVID-19 transmission: from data to intervention

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The speed and scope of detection of an infectious disease, in particular, timely identification and reporting of a new pathogen, is a major indicator of a country's ability to control infectious diseases. Findings of the Global Health Security (GHS) index[1] suggest that only 19% of countries have the ability to quickly detect and report epidemics of potential international concern, fewer than 5% of countries can rapidly respond to and mitigate the spread of an epidemic, and no country is fully prepared for epidemics or pandemics. Experience with coronavirus disease 2019 (COVID-19) seems to have confirmed these findings.

In *The Lancet Infectious Diseases*, Rene Niehus and colleagues[2] report a modelling approach with which they assessed the relative capacity for detection of imported cases of COVID-19 globally, and the prevalence of this disease among international travellers, and used these data to estimate cases of COVID-19 in Wuhan, China, from where the epidemic was first reported.

Using Singapore as a reference (because of its perceived perfect case-detection), Niehus and colleagues estimated that the global capacity to detect imported cases of COVID-19 before Feb 4, 2020, was 38% (95% highest posterior density interval [HPDI] 22–64) of Singapore's capacity, and was, respectively, 40% (95% HPDI 22–67), 37% (18–68), and 11% (0–42) of Singapore's capacity among countries with a high, medium, and low surveillance capacity, according to the GHS index.[2] This finding indicates that about 2·8 (95% HPDI 1·5–4·4) times current reported imported cases should have been detected if all countries had Singapore's detection capabilities. The ratio of detected to undetected cases (1:1·8, 95% HPDI 0·5–3·4) indicates that about 64% of imported cases have not been detected.

Based on imported cases aggregated by location, air travel volume, and GHS index for detection and reporting, Niehus and colleagues inferred that total COVID-19 cases in Wuhan have been underestimated by 70% based on the relatively lower prevalence of visitors who stayed for 7 days in Wuhan and underdetection capacity, and by 81% for 3-day visitors. This percentage is probably the lower bound since detection capacity was estimated relative to that in Singapore, which was probably not 100% efficient.[2] The relatively lower prevalence of COVID-19 among short-term visitors compared with residents of Wuhan has contributed to the underestimation.[2] However, Niehus and colleagues conclude that it is more acceptable than the effect of underdetection.

Niehus and colleagues remind us to reflect on causes of the high early case-fatality rate in Wuhan, which has important implication for countries struggling with COVID-19 now.[3,4] One explanation is the strong virulence of the virus, which is presumed to have crossed the species barrier from animal to human.[5] However, several studies on the evolution of SARS-CoV-2 imply that origin of the virus is still unknown. The virus identified in Wuhan might not be the first generation.[6,7] The high case-fatality rate in Wuhan is probably because the detection ability of viral nucleic acid was insufficient in the early stages of the outbreak. Most patients with mild disease had no access to a medical diagnosis and were excluded from calculation of the case-fatality rate, which was primarily contributed to by patients with severe disease.[8] Makeshift hospitals began to be built on Feb 4, 2020, in Wuhan, for medical care of patients with mild disease, and subsequent detection and treatment of mild cases decreased the number of deaths (numerator) while increasing the total number of cases (denominator).[9] Outside Hubei province, a lower case-fatality rate of 0·9% (121 of 13 500) has been attributed to perfect detection.[10] People in China (outside Hubei province) who visited any place outside of their regular residential area received a test, whereas people with no symptoms would be home quarantined for 14 days, particularly those who had recently visited