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# Early policy actions and emergency response to the COVID-19 pandemic in Mongolia: experiences and challenges

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Country-led control measures to contain the spread of the novel coronavirus, COVID-19, have been diverse. Originating in Wuhan, China, in December, 2019, the COVID-19 outbreak was declared a pandemic by WHO on March 11, 2020. In recognition of the severity of the outbreak, and having the longest shared border with China, the Government of Mongolia activated the State Emergency Committee in January, 2020, on the basis of the 2017 Disaster Protection Law. As a result, various public health measures have been taken that led to delaying the first confirmed case of COVID-19 until March 10, 2020, and with no intensive care admissions or deaths until July 6, 2020. These measures included promoting universal personal protection and preventions, such as the use of face masks and handwashing, restricting international travel, suspending all training and educational activities from kindergartens to universities, and banning major public gatherings such as the celebration of the national New Year holiday. These measures have been accompanied by active infection surveillance and self-isolation recommendations. The Mongolian case shows that with robust preventive systems, an effective response to a pandemic can be mounted in a low-income or middle-income country. We hereby examine the emergency preparedness experience, effectiveness, and challenges of the early outbreak policies on COVID-19 prevention in Mongolia, as well as any unintended consequences.

## Introduction

The novel coronavirus severe acute respiratory syndrome coronavirus 2, is a new pathogen causing COVID-19 viral pneumonia.<sup>1,2</sup> On Jan 30, 2020, WHO's Director-General declared the COVID-19 outbreak a Public Health Emergency of International Concern, and on March 11, 2020, declared it a pandemic.<sup>3,4</sup> The outbreak originated in the city of Wuhan, China, in December, 2019. As of July 5, 2020, the COVID-19 pandemic had more than 11 000 000 confirmed cases and 528 000 deaths in over 200 countries.<sup>3</sup> In response to the Public Health Emergency of International Concern, WHO issued country-level guidelines, developed with reference to former coronavirus outbreaks including the 2002 severe acute respiratory syndrome and the 2012 Middle East respiratory syndrome outbreaks.<sup>5</sup> These guidelines were intended as a detection and response tool for countries to review national capacities for managing the COVID-19 outbreak by identifying gaps, doing risk assessments, and planning additional investigations, responses, and control actions, such as early detection, contact tracing, physical distancing, as well as isolation and patient treatment.<sup>5</sup>

Neighbouring countries independently implemented a range of control measures upon the announcement of the outbreak in China. The extent of these measures has been diverse because of differences in national health-care systems, their underpinning sociocultural values, and technical and financial capacities, resulting in the need to weigh the human, sociocultural, and economic costs against those of control measures and their consequences.<sup>6</sup> An absence of transport hub monitoring for signs of disease in travellers in 2002 had enabled severe acute respiratory syndrome entry to Hong Kong.<sup>7</sup> For COVID-19, nearby high-income countries and territories such as Singapore, Hong Kong, Taiwan, and Japan were some of the first to respond with travel restrictions and quarantines

for those who had been in close contact with infected individuals or returning from high-risk areas. Similar responses, including initial recommendations on self-isolation, have been followed up in other countries over the past few months, arguably too late to contain the local spread of the disease.

Mongolia, a lower-middle-income country that has the longest shared border with China, developed early interventions approved by WHO to delay the onset of the outbreak and its severity. By early January, 2020, Mongolia initiated country-wide control measures according to its disaster preparedness legal framework, as supported by the WHO Mongolia country office, before COVID-19 was characterised as a Public Health Emergency of International Concern later that month. Although no immediate travel restrictions were recommended by WHO in early 2020, Mongolian authorities orchestrated a unique stepwise travel ban.<sup>8</sup> Lessons learnt from previous outbreaks prompted this early action in addition to the closure of educational institutions and aggressive promotion of public awareness. Reports of the response to COVID-19 from other low-income and middle-income countries (LMICs) are scarce and we believe that Mongolia's example provides important lessons in responding promptly to future epidemics or pandemics. We, therefore, examine in more detail the Mongolian experience on early prevention strategies, the effectiveness of these pre-emptive control measures in light of the global experience, and the challenges faced.

## Mongolia: the context

Mongolia has a dispersed population of approximately 3·3 million people living on a land mass the size of western Europe, exposed to harsh continental weather, with a long and severe winter climate where temperatures routinely dip to less than  $-30^{\circ}\text{C}$ . Nearly half of the total population

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lives in the capital Ulaanbaatar, mostly in small apartments or in large peri-urban ger districts without a proper sanitation system. Gers are traditional felt tents made use of in the peri-urban and rural environments, consisting of one large room, with often an extended family living in each ger (appendix). These circumstances in Ulaanbaatar would jeopardise containment strategies based on self-isolation without other rigorous nationwide actions.

For a lower-middle-income country, Mongolia has a remarkably high literacy rate. This literacy is a legacy of the Soviet era, and despite economic challenges and public system reforms over the past 30 years, it has maintained female literacy rates of 96.4% and male literacy rates of 93.0%. A high literacy rate has notable implications for public education and understanding of public health initiatives at the national level, regardless of national economic status.<sup>9</sup> Data further indicate that 2.5 million people use mobile telephones of which over 70% are smartphones, thus providing a valuable opportunity for the dissemination of public messages. Despite its high literacy rate, Mongolia reported in 2018 a high poverty rate of almost a third (28.4%) of the population and a 9.5% unemployment rate among those aged 15 years and older.<sup>10</sup>

Cardiovascular diseases are the most well-known risk factors for COVID-19-related mortality, followed by older age.<sup>11,12</sup> Chronic non-communicable diseases are the leading cause of morbidity and death in Mongolia, of which cardiovascular diseases account for almost a third of all mortality.<sup>13</sup> Nearly half of the adult population are overweight (31.9%) or obese (11.9%), 16.2% have ischaemic heart disease, and the prevalence of chronic obstructive pulmonary disease is estimated to be at approximately 10.0%.<sup>14–16</sup> Other population groups at high risk are those aged older than 70 years, which constitute a low percentage of Mongolia's total population (2.39% [n=77 634]).<sup>9</sup> Likewise, lifestyle risk factors indicators are poor, with the consumption of red meat being very high, few fruit and vegetables being consumed, and lives becoming increasingly sedentary.<sup>13,16,17</sup>

The efficiency of the emergency response in managing acute cases of the disease will greatly depend on how the health-care system will cope following a widespread outbreak. Main factors influencing the system's capacity include physician and nurse density per population, their technical skills, the number and availability of intensive care unit beds, and the quality of associated equipment, as well as the population demographics. Mongolia is currently undergoing a health system reform nationally, with primary care and secondary care centres well-established. There are approximately 12 000 doctors nationwide, resulting in one physician for 283 citizens, and more than 20 000 mid-level health workers of which more than 12 000 are nurses; this high ratio of doctors to patients is also a health system legacy from the socialist era.<sup>16</sup> Although the general infrastructure and facilities are mostly inadequate and less well-equipped, Mongolia's intensive care unit capacity is remarkably higher than

most other LMICs. With a total of 349 intensive care unit beds and 443 critical care ventilators in 70 intensive care unit facilities countrywide, this translates to approximately 11 intensive care unit beds per 100 000 inhabitants.<sup>18</sup>

### Activation of early emergency preparedness

In early January, 2020, several weeks before WHO's announcement of the COVID-19 pandemic, the Government of Mongolia initiated precautionary measures via the State Emergency Committee (SEC) and enactment of the Disaster Protection Law.<sup>19,20</sup> The Disaster Protection Law (in place since 2017) authorises the National Emergency Management Agency and SEC to direct emergency policies and measures via the Government of Mongolia and regional emergency committees.<sup>20</sup> The legal enforcement of SEC-led precautionary measures enabled a unified and focused administration of COVID-19 disaster management.<sup>19,20</sup> As summarised in the table, the initial measures taken included active surveillance activities such as health screening and quarantine control at the airport, and rail and land crossings. These actions are described in detail later.<sup>21</sup>

### Travel restrictions and closure of educational institutions

In late January, 2020, on the basis of SEC risk assessments, initial travel bans were introduced by the government, as a means of preventing the importation of the disease (figure 1). The control on Mongolia's southern border to China was tightened with air, road, and rail travel restrictions.<sup>21–23</sup> During the early stages of the pandemic, all travellers returning from low-risk countries were assessed at the borders and self-monitored at home according to a six symptom checklist (fever  $\geq 38^{\circ}\text{C}$ , sore throat, dry cough, fatigue, malaise, and shortness of breath) and were told to self-isolate at home for 2 weeks. Individuals returning from high-risk countries, such as South Korea, Japan, and Italy, were automatically quarantined for 2 weeks as recommended by WHO in designated quarantine camps.<sup>24</sup> SEC introduced a COVID-19-related temporary regulation for quarantine, which included definitions for high-risk countries and primary contacts; a scheme for transporting, triaging, and managing suspected cases was implemented with rules and roles for multidisciplinary teams working in the quarantine camps.<sup>24</sup> The 2 week isolation period was later extended to 3 weeks to maximise quarantine outcomes, because of anecdotal evidence of incubation periods occasionally extending past the 2 week period and individuals that tested negative at first testing positive later on.<sup>21</sup> Flights were initially restricted to and from countries with active outbreaks. Once the first confirmed imported case was announced on March 10, 2020, all travel in and out of Mongolia was banned. Subsequently, special evacuation flights via Incheon, Tokyo, Moscow, Berlin, and Istanbul were available for repatriation to or from Mongolia, with obligatory quarantine and testing in the designated camps (figure 1).<sup>21</sup>

	Global situation	Worldwide cases/ deaths	Key actions by the Mongolian Government
Dec 30, 2019– Jan 5, 2020	WHO China country office informed by Chinese authorities about pneumonia of unknown pathogen; global emergency response notes released	..	..
Jan 6–12, 2020	China isolates new coronavirus and shares genetic sequence of the COVID-19 virus	..	First public precautions introduced by Ministry of Health on Jan 6, 2020
Jan 13–19, 2020	Thailand and Japan confirm first imported cases	282/NA	Government meetings initiated by Minister of Health, according to emergency preparedness regulations; one-window policy introduced for COVID-19 information
Jan 20–26, 2020	Reported cases continue to rise in China; South Korea confirms first case on Jan 20, 2020	2014/56	Educational institutions at all levels are temporarily closed until March 30, 2020; travel restrictions applied to China
Jan 27–Feb 2, 2020	WHO characterises COVID-19 as a Public Health Emergency of International Concern on Jan 30, 2020; Europe and North America report cases	14 557/305	Initiation of isolation for incoming travellers from countries reported to have cases of the disease. Tsagaan Sar lunar New Year restrictions
Feb 3–9, 2020	China remains the outbreak epicentre with more than 30 000 cases and 700 deaths	37 558/813	Chinese border restrictions tighten. Ban on import of some foods such as poultry and eggs
Feb 10–16, 2020	First case reported in Egypt as first in African continent; global traveller quarantine advice published by WHO	51 857/1669	Tsagaan Sar cancellation officially requested to the National Security Board; Government of Mongolia declares emergency high alert status on Feb 12, 2020; health system preparedness raised, isolation camps set up and widespread public face mask wearing, leading to shortages
Feb 17–23, 2020	Chinese cumulative death count reaches 2000; Iran reports first confirmed case; South Korean cases increase sharply	78 811/2462	Domestic travel ban applied during the Tsagaan Sar (Feb 23–27); disinfection protocols for port trucks and trains are provided. Risk assessment is ordered for all provinces; all religious gatherings are banned
Feb 24– March 3, 2020	Stigmatisation alerted on WHO situation reports; South Korean case number reaches 1000; WHO risk assessment states global and regional risk status to be high	90 869/3112	Flights to and from South Korea and Japan are cancelled until March 2, 2020; travellers at high risk in isolated camps for 2 weeks
March 2–8, 2020	Containment is global top priority; case numbers rise in South Korea, Iran, and European nations	105 586/3584	Extension of domestic travel ban until March 3, 2020; emergency call service established with a 4 digit number
March 9–15, 2020	Global pandemic status declared by WHO on March 11, 2020, and 143 countries report confirmed cases, Europe is epicentre of pandemic	153 517/5735	First laboratory confirmed case detected from a foreign national on March 10, 2020; all possible contacts traced; public businesses except grocery shops and domestic travel between inter-city and provinces closed until March 16, 2020; all international flights, rail, and land travel banned
March 16– April 16, 2020	USA becomes the epicentre of the pandemic; more than 90% of the world's students affected by school closures; China lifts Wuhan lockdown on April 8, 2020	1 051 697/56 986	School closures until September 2020; new resolution with seven measures to protect public health and income; preparation and equipping of a 300-bed emergency hospital

Table: Timeline of global and Mongolian actions against the COVID-19 outbreak

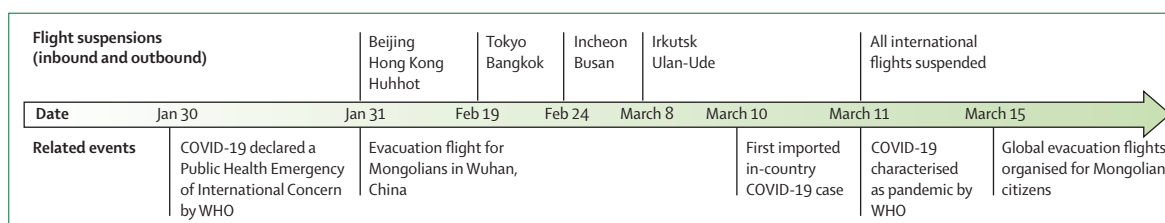


Figure 1: Flight suspensions from Chinggis Khan International Airport in Ulaanbaatar

In addition to travel, all major public engagements and gatherings, including the annual celebration of Tsagaan Sar (Mongolian lunar New Year) in late February, were prohibited.<sup>21</sup> This celebration is the main annual public holiday that involves the mass movement of people, many public gatherings, and is a major economic event for traders and commercial entities. Furthermore, families visit older relatives' residences, with plenty of close-contact behaviours including cheek kissing. Advertisements promoting this national celebration were ordered to be replaced with COVID-19 public awareness advertisements informing the public on how to prevent the spread of the disease. Domestic travel was prohibited during

this holiday season, initially by restricting travel between the capital city Ulaanbaatar and the provincial capitals between Feb 23 and Feb 27, 2020, after which a 1 week extension was implemented.<sup>21</sup> The intensity and importance of these measures during Tsagaan Sar cannot be underestimated and their enforcement is a major achievement given the cultural and symbolic importance of this national holiday. Such domestic travel restrictions were again put in place after the first confirmed COVID-19 case was announced.

Another notable early stage response to the COVID-19 outbreak was the closure of all educational institutions, at all levels, throughout the country, with traditional

teaching replaced by distance learning approaches. In January, before there were any confirmed COVID-19 cases in Mongolia, the SEC ordered the closure of all kindergartens, primary and secondary schools, universities, vocational schools, and libraries.<sup>21</sup> All educational institutions in both the public and private sectors were initially closed until March 2, 2020. These closures were later extended to March 30, and then extended further to Sept 1, 2020.<sup>22,23,25,26</sup> All annual and exit examinations for the year 2020 were cancelled.<sup>22,26</sup> With support from UNICEF Mongolia, the Ministry of Education, Culture, Science, and Sports, initiated distance learning programmes via television channels for younger children (4–6 years old) up to children in 12th grade classes (18 years old; figure 2). Tele-classes have also been produced and broadcasted in the minority languages for the Kazakh and Tuva populations. In a similar manner, e-learning programmes were commissioned for higher education institutions, universities, and colleges, and they were also provided with online educational content, wherever available and possible.

### Health promotion and disease prevention activities

From early on, the public were engaged and kept up to date through public information provision and action, coordinated by the SEC and organised by government agencies such as the Ministry of Health. Predominantly spreading health promotion messages via public media, the SEC initiated a one-window policy to provide accessible and reliable information from only one source.<sup>21</sup> The one-window policy included official information and announcements communicated daily at a set time (1100 h) through all communication channels and media. The information provided included periodic and daily latest updates on self-isolation and quarantine, test results from suspected cases, general health recommendations, and the global status of the pandemic. The Ministry of Health has been issuing frequent text message alerts nationwide using all four mobile telephone carriers. The alert messages include recommendations on avoiding unnecessary domestic and international travel, self-isolation for incoming travellers, nutritional advice, and personal hygiene and protective measures.



**Figure 2:** Schoolchildren studying through a publicly available television channel. Left: Ger household in countryside. Right: apartment household in Ulaanbaatar.

Although there was no general lockdown imposed on all Mongolian citizens, some businesses in which physical distancing was not possible were closed, such as in the entertainment industry, including nightclubs and bars. Nevertheless, the public has broadly responded by taking precautionary measures by increasing hygienic and protective behaviours, including the wearing of face masks. Unlike many neighbouring Asian countries, who use face masks to protect against air pollution and disease, Mongolians had not adopted the use of face masks before the COVID-19 outbreak. Since February, 2020, the wearing of face masks has been widely adopted and can be seen on the streets, workplaces, and particularly in the markets and health-care facilities. This demand for face masks has led to shortages and the emergence and use of improvised home-made fabric face masks. Evidence for their use, particularly non-commercial types, is incongruent, which has led to inconsistent practice recommendations globally.<sup>27–30</sup> Nevertheless, their use was strongly promoted by Mongolian government agencies and state inspectors that ordered organisations, businesses, and other services, such as public transport, to serve only those people wearing face masks since mid-February. As of April 9, 2020, the Mongolian parliament has been discussing a bill against the pandemic, that includes laws to make mask-wearing compulsory. Alongside public action, tertiary-level hospitals in the public sector check visitors' temperatures with the use of infrared thermometers and recommend that citizens avoid unnecessary visits to health-care facilities. Upon the Ulaanbaatar city mayor's orders of mandatory hand sanitiser use among customer services and businesses, hand sanitiser use has anecdotally increased.<sup>31,32</sup>

### Case surveillance and health system

Before the end of February, a structured surveillance system for contact tracing was set in place to enable the required observation and isolation of contacts to contain the spread of the disease. Suspected cases and those who had had contact with them were identified with the use of case-definition-derived criteria.<sup>24</sup> These criteria divided the case handling categories into suspected or confirmed, or individuals who are at high risk of being infected (eg, those who have an extensive travel history). All confirmed or suspected cases and the primary contacts of confirmed cases were hospitalised at the National Centre for Communicable Diseases. A primary contact was defined as someone who came within 1 metre of the patient in the 4 days before the first appearance of clinical symptoms. To regulate these actions, legislation was introduced with criminal charges and sanctions for misreporting or intentionally falsifying health conditions.<sup>22,33</sup>

For testing, in the early stages of emergency preparedness, 2000 primers, probes, and positive controls were ordered from Japan for nasopharyngeal swab specimen testing. One-step RT-PCR tests have been done on an

Applied Biosystems 7500 system (Waltham, MA, USA), with the use of primers and probes targeting the *N* and *ORF1B* genes of severe acute respiratory syndrome coronavirus 2. Laboratory testing has been organised by the National Influenza Centre Virology Laboratory of the National Centre for Communicable Diseases of Mongolia and done with technical guidance from WHO and assay protocols from the National Institute of Infectious Diseases of Tokyo, Japan.<sup>34</sup> All incoming travellers, so far more than 8000, have each been tested throughout their quarantine to ensure the accurate establishing of case status. As for community testing, the routine sentinel surveillance system has been collecting more than 200 nasopharyngeal samples each week for COVID-19 testing from referred patients with acute respiratory illnesses and influenza-like syndrome. In addition, there has been random community sampling and walk-in testing sites have been made available in Ulaanbaatar. Mongolia had done 16 474 tests as of June 1, 2020, which resulted in one confirmed case per 88 tests or a 1.13% positivity rate. Nevertheless, these results surpass the ten tests per confirmed case recommendation of WHO.<sup>35</sup> Meanwhile, 515 tests per 100 000 population were done in Mongolia, given that widespread community testing was not required because of no documented community transmissions with the requirement of contact tracing and testing.

Recognising that the current health-care system might not be able to cope with a widespread COVID-19 outbreak, the government approved the procurement of equipment and preparation of a 300 bed hospital as part of the outbreak preparation. Since February, isolation camps have been prepared in public hospitals and health resorts, as well as private hospitals, holiday camps, hotels, and sport complexes.<sup>21</sup>

The Mongolian health-care system is heavily dependent on the government budget and is nearly universally accessible. Many public health and hospital services for children younger than 18 years, as well as those for pregnancy and maternity, tuberculosis, cancer, emergency care, and in particular, all health care in use during pandemics including major infection control measures, are mostly covered by the government regardless of patients' insurance status according to Mongolian health law.<sup>36</sup> COVID-19 health-care and isolation or quarantine services have been free of charge in Mongolia, except for three meals at a cost of US\$20 per day, during mandatory quarantine in isolation camps. Overall, COVID-19-related health-care delivery has been made universally accessible in Mongolia.

### First case and contact tracing

According to the aforementioned surveillance system, more than 2000 patients suspected to have the virus had been placed in isolation in a hospital setting and more than 3000 people were in isolation camps by early April, 2020. The National Centre for Communicable

Diseases has been leading the clinical management and contact tracing of suspected and confirmed cases. This centre's Department of Early Recognition and Response is a well-established field epidemiology unit, and has done systematic nationwide contact tracing through a multidisciplinary approach engaging with other government units. On March 10, 2020, the SEC publicly announced the first laboratory-confirmed imported case of COVID-19 in Mongolia. A French national entered Mongolia via a flight from Moscow on March 2, 2020, and alongside all other travellers from low-risk countries (France and Russia were low-risk countries at the time) they were told to self-isolate and report symptoms, but did not comply. The 56-year-old man went to work for 4 days without developing symptoms. He then travelled by train to a provincial mining camp on March 7, 2020. He reported malaise and a runny nose to the camp physician with a temperature of 38.0°C. The provincial response team was notified, and a nasopharyngeal sample was sent to Ulaanbaatar for testing. After confirming the first case, the SEC restricted his domestic movements and he was placed in a quarantine camp.<sup>21</sup> Contact tracing identified several close contacts who had travelled to distant provinces who were subsequently traced and isolated in their respective locations. The National Centre for Communicable Diseases confirmed on March 16, 2020, that all 181 primary contacts of this patient tested negative and were being observed for symptoms in quarantine camps. Subsequently, 190 additional Mongolian citizens who were repatriated by evacuation flights or ground transports from abroad after tested positive while in quarantine. As of July 6, 2020, all 220 patients were clinically stable, 188 are fully recovered, and there have been zero COVID-19 admissions into intensive care units or confirmed deaths.

### Challenges and unintended consequences

Despite having the advantage of delaying an outbreak of COVID-19, the disadvantages and unintended consequences of early action and a long-term state of preparedness are not to be overlooked. Children's educational goals and achievements are of major importance. Mongolia has a high ratio of schools, universities, and centres of higher education per head of population. The suspension of face-to-face teaching has resonated across all levels of education, despite it being important to contain the disease.<sup>21</sup> However, so far this change has had complex and unexpected consequences. The main consequences of school suspensions include unintentional violations of children's right to education, and at times neglect and difficulties in meeting parenting duties. Together with these issues, home confinement for schooling has affected the physical and psychological wellbeing of children and adolescents.<sup>37</sup> It has been stated by UNICEF that the closure of schools and kindergartens can put many children's safety and wellbeing at risk. For example, lifestyle changes during such home

confinements are inevitable, ranging from a reduction in physical activity to less social interaction with peers and an increased use of smartphones and social media. Children are now confined to their home for long periods with few chances to be outside for play or socialise with peers. Parents who were unable to miss work for multiple days, and were reliant on schools and kindergartens for education and childcare during working hours, were forced to leave their children home unattended, contributing to unintentional or accidental injuries to children in their homes.<sup>38</sup> In response to this concern expressed during a press conference, the government introduced distance learning, and decided that salary-earning parents and guardians of children younger than 12 would be allowed to work remotely. The government has announced multiple methods of support, including 7–14 days' paid leave for parents of sick children, the reduction of in-office work hours, and a social security payment waiver for 6 months.<sup>22,23,39</sup>

These restrictive measures immensely affected the susceptible population, particularly in urban areas of Mongolia. According to the 2018 Mongolia Poverty Update report, 83% of the wage workers are located in urban areas where the industry and service sectors are concentrated.<sup>10</sup> Ulaanbaatar, the capital and largest city, has a persistently high population living under the poverty line who are mostly dependent on daily wage work. Although some of the workers continue to go to work, if they have to stay at home because of self-isolation, the nature of their work or children, they face extreme hardship because of the consequences of these emergency response actions.<sup>40</sup> These groups do not benefit from paid leave and other government support. The effect of the pandemic responses has been reported to be higher among poor families in the literature from other countries globally.<sup>41,42</sup>

Another serious consequence of these long quarantine-like conditions is the harm to Mongolia's export-based economy. For example, mining is the main source of export income and this was reported to have diminished as coal exports were restricted because of border restrictions and fear of fuel shortages.<sup>39</sup>

There are also consequences for Mongolians travelling abroad. As a result of travel bans, thousands of Mongolians in foreign countries were stranded and only had the option to return by government-chartered evacuation flights or by designated entry points on land (these entry points were only permitted for permanent residents and students in China and Russia). Evacuation flights were restricted to 900 passengers per month because of multiple factors, including the little availability of quarantine camp accommodation and a shortage of flight crew members (as they were isolated along with incoming citizens). The SEC prioritised people with serious health conditions, infants and children, older people (>60 years), and women in the late stages of pregnancy for such evacuation flights. By the end of May,

3488 people had been repatriated on 18 flights and 5580 by land travel; more than 8000 citizens remained stranded abroad, often living in extreme conditions because of diminishing funds.<sup>43</sup>

Finally, there are also some unintended, though potentially positive, consequences. Ulaanbaatar, known to be one of the most polluted capitals in the world during the winter months, with substantial related morbidity and mortality across all age groups, could benefit from a considerable reduction in air pollution from reduced transport and industrial activity.<sup>44,45</sup> In other countries this pandemic has led to reports of reduced city smog.<sup>46</sup> However, domestic solid fuel burning is the main source of Ulaanbaatar's air pollution, which is expected to increase because of the home confinements. Together with the newly introduced raw coal ban and the introduction of briquettes to reduce emissions in the capitol, the actual effect of COVID-19 on Ulaanbaatar's air quality is yet to be established.

Another unintended consequence, anecdotally occurring throughout the world, has been an increased occurrence of supportive community activities in neighbourhoods, such as grocery deliveries for those who are vulnerable. These supportive activities result from a need to assist one another and to collaborate to obtain the provisions required and to care for the susceptible populations who are urged to self-isolate for long periods and who are at risk of mental and physical sequelae.<sup>47</sup>

## Discussion

We have described a timely and apparently effective response of a large lower-middle-income country neighbouring China to the COVID-19 pandemic. Multidisciplinary cooperation, early engagement, and guidance from the WHO Mongolia office, have enabled the health authorities to successfully undertake early risk management. Early border controls, so far, have been one of the most effective preventive measures taken, resulting in the remarkably low infection rates in some countries and states such as Mongolia and Taiwan.<sup>48</sup> Both have taken similar pre-emptive actions, on the basis of lessons learnt during the 2002 severe acute respiratory syndrome outbreak, which enabled the establishment of early detection and quarantine systems.<sup>49</sup> Taiwan set up its National Health Command Centre, which was ready to respond to the COVID-19 outbreak by applying early policies and suspensions, as well as aggressively promoting public awareness. Early measures taken by Taiwan included obtaining travel histories and instituting border controls.<sup>48</sup>

Most European countries have attempted a more nuanced, slowly evolving, approach by gradually responding with control measures as infection rates rise. This approach, it now appears, could overwhelm their health services. The difference in their approach could be explained by cultural differences such as the style of governance or political systems, and the perceptions of a

need to preserve the liberty of individuals during actions taken by governments and a varied understanding of collective responsibility. Other factors such as previous experiences, size of countries, population diversity, and socioeconomic factors have undoubtedly also played a role.

During the course of the pandemic restrictions, the government of Mongolia implemented various actions to recover the economy.<sup>22,39</sup> These include re-allowing coal export, tax waivers for both private and public sector workers, and monetary support for the private sector to secure jobs. However, these policy actions did not address the lockdown exit strategy in further detail. Governmental policy prioritises containment strategies and extension of the lockdown of some activities (eg, schools and education centres, and entertainment businesses) and border control on a month-by-month basis depending on the global situation.<sup>21</sup> The parliamentary vote in June considered a further extension because of the still-present high risk of transmission. The restrictions might last until the end of the Naadam public holiday in July, which traditionally involves mass-gatherings and large sporting events. Although Mongolia successfully defended against an initial community transmission of COVID-19, longer-term outcomes of extreme precautionary measures might potentially bring a huge burden on the economy.

Given that LMICs are likely to be overwhelmed by such an epidemic because of their lower health-care system capacity and an inability to implement adequate quarantine approaches (because a large part of their population engage in daily work and get daily wages), they will require stricter and more effective early control measures to control the pandemic.<sup>50</sup> Travel restrictions and public gatherings seem to be more important than total lockdown, and isolation and quarantine need to be facilitated through government interventions, such as Mongolia's camps, since many of the LMICs poorer populations do not have the means to self-isolate at home. Parallel examples of compliance (The Gambia) and non-compliance to these measures were evidenced during the Ebola virus epidemic in Africa.<sup>51</sup> Allocation of adequate resources to develop health systems during periods without public health emergencies would enable adequate preparation and timely and relevant preventive response measures in anticipation of outbreaks, epidemics, or pandemics. This preparation is important since transmission of such infections transcends borders and is becoming more common as the world becomes increasingly interconnected. Mongolia's high literacy rate might be an important contributor to the effective understanding and response of the public to the national preventive measures that were communicated by the government. This case is potentially yet another example showing the importance of universal education in combating health issues and emergencies. An increasing use of mobile telephones, radio, television, and internet

in LMICs, such as in Mongolia, further show the potential to continue some business and education activities remotely in LMICs. The Mongolian case shows that with advanced preparedness, robust preventive systems to mount an effective response to a pandemic is indeed possible for an LMIC.

#### Contributors

SM-H and GNT conceived the idea during the initial global outbreak of COVID-19 in early January. SM-H initiated the conceptualisation of the project. SM-H, NT, CO, DW, RE, and ED were involved in designing the study. CO, ED, and IN coordinated the data collection, and the policy document review. ED did the literature review on the subject. RE and ED collected the data, did the policy review, and did the initial analysis. SM-H, CO, and DW supervised RE, ED, and the assistant students. NT, IN, SM-H, and CO conducted further analysis. RE and ED wrote the first drafts of the manuscript. All authors discussed, revised, and approved the final manuscript after revisions.

#### Declaration of interests

We declare no competing interests.

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