Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Global shortage of personal protective equipment

The COVID-19 pandemic has unearthed lack of coordination and equal access to personal protective equipment around the world. Talha Burki reports.

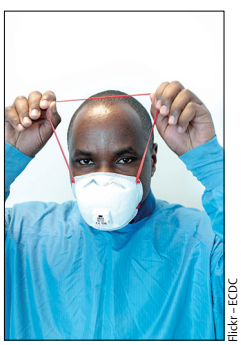
On May 28, 2020, Médecins Sans Frontières (MSF) issued a press release calling for the market in personal protective equipment (PPE) to be regulated. "The COVID-19 pandemic has caused shortages and price rises in PPE, especially those needed to protect frontline health workers", noted MSF. "The situation has thrown into danger not only healthcare workers, but the ability of providers like MSF to respond to other vital healthcare needs. Regulation to ensure that personal protective equipment is distributed in an equitable and transparent manner during the COVID-19 pandemic must be put in place."

By some distance, the world's largest manufacturer of PPE is China. Before the pandemic, China was responsible for half the world's supply of surgical masks and was the only place capable of mass producing clinical gowns. So the severe shortages that characterised the early stages of the pandemic were probably unavoidable. Supply was already disrupted by the Chinese New Year, which typically interrupts production for 10–14 days. This year's festivities coincided with an explosion of cases of COVID-19 within China. The public health policies that were introduced in response to the emergence of severe acute respiratory syndrome coronavirus 2 prevented a lot of workers from returning to their factory jobs.

Alongside the constricted supply came a surge in domestic demand for PPE. China imposed export restrictions. Other countries, including several in Europe, would subsequently enact similar measures, with reports emerging in April that USAID had informed the recipients of its grants that they were not to use any of these funds to buy surgical masks, N95 respirators, or surgical gloves. International travel restrictions compounded the problem.

In early March, WHO noted that since the start of the pandemic, the price of surgical masks had increased sixfold, the price of N95 respirators had trebled, and the price of surgical gowns had doubled. They urged industry to raise its production of PPE by 40%. Countries issued contingency plans for stock-outs. Nations such as the UK and the USA reported dangerously low supplies of PPE. In Italy, the shortages contributed to the high burden of infection and death among hospital staff. As prices continued to rise, countries competed for PPE on the open market. There were even reports of US states bidding against one another. At the end of March, WHO Director-General Tedros Adhanom Ghebreyesus stated that "the chronic global shortage of personal protective equipment is now one of the most urgent threats to our collective ability to save lives".

The initial disruption appears to have stabilised now. China now produces at least 110 million surgical masks every day; before the pandemic hit, production stood at 20 million masks per day. Chinese billionaire Jack Ma has made a series of PPE donations to Africa, through his charitable foundations, and the United Arab Emirates has pledged three aircrafts to deliver essential cargo and personnel until the end of the year. "Things are certainly better", said Paul Molinaro, Chief of Operations Support and Logistics at WHO. "The market did eventually respond, we have seen some new manufacturers come online and the surge in demand has somewhat subsided; but I would not say that the issues have been necessarily resolved, there are still constraints on the market." There are continuing shortages of particular raw materials and not all manufacturers have returned to pre-pandemic levels of production. Moreover, some companies that diverted their production facilities to making PPE may stop making the products as the pandemic runs its course. UNICEF reckons that by the end of 2020, demand for surgical masks could reach 2·2 billion, demand for gloves could reach 1·1 billion, and demand for face shields could reach 8·8 million.



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All of which means that PPE will remain a sellers' market for the foreseeable future. Buyers have to offer a firm financial commitment in advance of the sale. If they are unable to do so, or act too slowly, chances are the vendor will look elsewhere. This puts low income countries at a disadvantage. "In every country we work with, there is not enough PPE either to set up the COVID-19 centre to take in and confirm patients, or to protect the general hospital and to ensure the continuity of medical services", explains Isabelle Defourny, director of operations at MSF. "In different countries, we are seeing more and more staff get sick." She points out that when hospitals start to act as a setting actively amplifying an infectious disease outbreak, because of a lack of PPE, they eventually have to be closed.

The situation in war-torn Yemen is particularly concerning. "There is some PPE for treating COVID-19 patients, but nowhere near enough to protect the staff in different hospitals and health centres", said Defourny. "It is building into a disaster; the

number of severe cases of COVID-19 are increasing at the same time as medical staff are becoming infected and are unable to work." She worries that even as the pandemic eases in the developed world, the global shortages of PPE will continue as countries build up their stock of PPE in expectation of a second wave of cases.

WHO and several partners, including MSF, have established a supply portal through which countries can order PPE. "The idea is to co-ordinate an approach to the market so that parties are not competing against each other", Molinaro told *The Lancet Infectious Diseases*. "The portal is really trying to resolve the issue of the fragmented demand." The European Union and the African Union have established their own collaborative procurement processes.

Individual countries decide for themselves what to do with their supplies of PPE. In the early stages of pandemic in England, the National Health Service was prioritised over care homes, for example. Members of the consortium behind the WHO supply portal can advise on prioritisation between countries, but there is no formal global mechanism for assigning PPE to the places most in need. MSF believes that this needs to change. "It is extraordinarily important to have some kind of criteria to decide what happens when there is a shortage, otherwise you risk a situation where many countries will not be able to access the PPE they desperately need, while other countries may have a surplus", said Defourny.

Andrew Lakoff (University of Southern California, Los Angeles, USA) points out that over the past decade or so there has been a great deal of discussion over how best to ensure equitable access to vaccines, drugs, and diagnostics, but there has not been the same kind of attention paid to PPE. "MSF's intervention is important", he said. "We certainly need some kind of internationally agreed way of keeping global supply chains moving through times of pandemic; I would imagine WHO would be very well placed to try to coordinate that."

Molinaro stresses the importance of flexibility. It is much easier to forecast demand for a vaccine, for example, than for PPE. The COVID-19 pandemic saw demand for some protective items surge by several thousand percent. "During a pandemic, the epidemiology changes from week to week; we have to be responsive to that", adds Molinaro. "In the longer-term, we will have to figure out what happens if there is a large second wave of cases, or indeed a different pandemic. There is a limit to how much we can stockpile."

Talha Burki

Infectious disease surveillance update

Guinea worm in Ethiopia

Cases of Guinea worm disease have been reported in Ethiopia for the first time since December 2017. Between Apr 2 and 27, there were seven suspected human cases of Guinea worm in the Gog district in the Gambella region. The reported cases all drank water from unsafe farm ponds, which were also previously associated with baboon infection in June 2019. Worm samples from all the suspected cases were collected and sent to the US Centres for Disease Control and Prevention laboratory for confirmation. All cases are being followed up in the Guinea Worm Case Containment Centre.

Dengue in Brazil

198 990 confirmed cases of dengue have been reported in Paraná State, Brazil, including 139 dengue related deaths as of Jun 2. Of the 343 municipalities in the state, 237 are in an epidemic status for the disease. Most of the reported cases (181 298, 91%) are indigenous cases contracted in the city where the patients live. The highest number of cases were reported in Londrina (n=45 459) municipality, followed by Foz de Iguaçu (n=25 147) and Maringá (n=16 195). Countrywide Brazil has reported 1 040 481 total cases, including 342 dengue-related deaths.

Ebola virus disease in DR Congo

The 11th outbreak of Ebola virus disease in DR Congo was declared on Jun 1 in the Equateur Province in the northwest of the country. Eight epidemiologically linked cases have been reported in the city of Mbandaka. The cases are two confirmed cases, two suspected cases, as well as four deaths (one confirmed and three probable). Equateur Province experienced its last outbreak in May–June 2018, where 54 cases were reported including 33 deaths. The tenth outbreak which was declared in August 2018 is still ongoing.

Botulism in Ukraine

On May 24, the Ukraine Information Service reported two cases of food-borne botulism from the Odessa region, Ukraine. The cases were from the Poldolsky District in members of a family who had consumed a meal consisting of a home-cooked silver carp. Husband and wife contracted the botulin toxin produced by *Clostridium botulinum*. The toxin causes a severe type of flaccid paralysis. The diagnosis was confirmed by the Ministry of Health's Odessa Regional Laboratory centre.

Ruth Zwizwai

For more on **Guinea worm disease in Ethiopia** see https://www.who.int/csr/don/25-may-2020-dracunculiasis-ethiopia/en/

For more on **dengue in Brazil** see http://outbreaknewstoday.com/dengue-in-brazil-cases-near-200k-in-parana-58469/

For more on **Ebola virus disease in DR Congo** see https://www.who.int/csr/don/03-June-2020-ebola-drc/en/

For more on **botulism in Ukraine** see http://outbreaknewstoday.com/botulism-reported-in-ukrainian-couple-linked-to-smoked-fish-80539/