Comment

A simulation of a COVID-19 vaccine trial in Bogor, Indonesia.

COVID vaccination logistics: five steps to take now

Yot Teerawattananon & Saudamini Vishwanath Dabak

Beyond vaccine safety, efficacy and procurement lie licensing and delivery — nations must get ready.

There are currently more than 40 candidate vaccines for COVID-19 in clinical evaluation, and more than 150 in preclinical development[1]. Creating a safe and effective vaccine is akin to striking base camp on Everest — the gruelling climb to procurement and delivery lies ahead. Countries must develop a comprehensive and strategic plan for vaccine roll-out.

As technocrats in Thailand and Singapore, we are working with governments in low- and middle-income countries (LMICs) in Asia and Africa to support their responses to COVID-19. In our view, there are five urgent steps nations must take now so they are poised to protect their own citizens and those elsewhere. As this pandemic has

shown, in a globalized world, none of us is safe until all of us are.

Consider pilot projects

All countries have a vaccination programme for children[2]. But those for adults are scarce: by 2017, just 114 of the 194 member states of the World Health Organization (WHO) had adult vaccination programmes against seasonal influenza[3]. And in India, for example, the only vaccine currently recommended for adults is against tetanus, for pregnant women. Some nations advise immunization for seasonal flu only for specific groups, such as elderly people.

Rolling out childhood and adult vaccines differs in terms of the delivery logistics, social expectations, community engagement, attitudes of providers and more[4]. When COVID-19 vaccines become available, around 40% of countries will be encountering these differences for the first time[3].

Such nations might consider running a pilot programme for adult vaccination using the seasonal flu vaccine, which in the Northern Hemisphere is usually provided in October and November, and in the Southern Hemisphere from April to May. Countries are cash-strapped because of lockdowns and shrinking economies, making this a difficult time to introduce new interventions. But a flu-vaccine pilot could be done in a small area, allowing that country to test its community engagement, delivery operations (including the ability to keep vaccines cold along the chain) and monitoring and evaluation system.

Philanthropists and funding organizations should consider this a helpful part of a COVID-19 response strategy. The Asian Development Bank, for one, seems to be receptive to this idea[5].

Use pre-qualification

Several barriers delay the national registration process for vaccines and other health technologies in LMICs[6]. Manufacturers might focus on registering their products in high-income countries first, where they stand to make a larger profit. Companies can be hesitant to engage with divergent regulatory requirements and processes, especially if procedures are unfamiliar or onerous. Bodies that are equivalent to the US Food and Drug Administration in LMICs often lack the resources and expertise required to review industry submissions quickly.

Together, these factors can result in long delays in registering vaccines. One 2016 study showed a typical lag of 4–7 years between a company's first regulatory submission and the vaccine's final approval in sub-Saharan Africa, for example[7]. This timeline is untenable for a COVID-19 vaccine.

It would be more efficient to make use of the WHO pre-qualification programme. This assesses the safety, quality and efficacy of vaccines for distribution by organizations such as Gavi, the Vaccine Alliance in Geneva, Switzerland. The programme was implemented in 2001 to improve access to medicines for HIV/AIDS, malaria and tuberculosis, and in 2019 was used to fast-track uptake of the Ebola vaccine in at-risk countries. By 2018, only 36 countries and CARICOM (15 Caribbean nations) were participating in the pre-qualification mechanism[8], each committing to speed up their standard regulatory processes for vaccines that have already been assessed by the WHO. Thailand is one of only a handful of middle-income countries involved in the programme. More should consider it.

The WHO should actively involve countries from all income levels in a pre-qualification process specifically designed for COVID-19 vaccines. The organization should ensure that submission dossiers and the results of its assessment are made fully transparent and easily accessible. This will be especially important for controversial products, such as Russia's COVID-19 vaccine, which bypassed some of the usual steps of development and is now reportedly being considered for WHO pre-qualification (see go.nature.com/3eqcoa9). Ideally, registration of a WHO-approved COVID-19 vaccine would be automatic in participating nations.

"It will be impossible to prevent many wealthy nations from elbowing to the front of the queue."

Establish national task forces

Each country needs to design its own deliberative process for COVID-19 vaccination. Most nations — 170 — already have National Immunization Technical Advisory Groups (NITAGs) or equivalent bodies to select vaccines, determine target populations, establish delivery platforms and so on. The WHO Strategic Advisory Group of Experts (SAGE) also has a working group tasked with advising member states on issues related to COVID-19 vaccines.

These groups are conventionally made up only of health-sector experts. Yet because the implementation of COVID-19 vaccines will be as much about national economies and social values as health, we propose that nations consider establishing a 'NITAG Plus' COVID-19 task force. It would comprise representatives from ministries of finance, labour, commerce or industry, security and education. This would ensure that all issues are considered, from vaccine safety and efficacy to economic, social, logistical and ethical factors. In our view, this task force should be led by the head of state to provide an overarching vision and generate consensus. That said, power to act must be weighed against bureaucratic paralysis.

Disaster-recovery agencies could provide some lessons, such as those convened after

CRISTINA ALDEHUELA/AFP/GETTY

A nurse in Ghana checks a malaria vaccine, one of many that must be kept cold.

the 2004 tsunami — including the Reconstruction and Development Agency in Sri Lanka, for example. Something along these lines is needed: there could easily be more than one vaccine available by the end of next year, and countries will need to make evidence-based decisions with buy-in from multiple stakeholders, while balancing many trade-offs.

Discourage bilateral negotiations

To stop only the richest countries having access to a vaccine, the WHO and its partners Gavi and the Coalition for Epidemic Preparedness Innovations launched a global mechanism to allocate doses once available. The COVAX Facility aims to ensure that each participating country can vaccinate 20% of its population, regardless of its income level. More than 170 nations are engaged in discussions to participate, and by 21 September, 64 richer nations had committed to making purchases through the facility (see go.nature.com/2j7xogs and go.nature.com/3mpqbi5).

Uncertainty remains. At the time of writing, COVAX has just one formal agreement on the number of doses: with the drug firms Sanofi and GlaxoSmithKline, which intend to make 200 million doses of their joint COVID-19 vaccine available to the facility, if the vaccine is approved. Furthermore, many nations might be uncomfortable with the low target of 20% coverage, because estimates suggest that vaccination levels of more than 60–70% are needed[9] to achieve herd immunity for SARS-CoV-2 (the threshold at which a virus can't spread through a population because most people are protected against infection). This has led some countries to make their own agreements directly with companies. The United States, for example, has said it will not join COVAX, and instead has committed billions of dollars to manufacturers in a programme called Operation Warp Speed. The United Kingdom has engaged with COVAX, but has also committed to purchasing 100 million doses of the COVID-19 vaccine developed by the University of Oxford and the drug firm AstraZeneca.

Given limited global production capacity and the predicted demand for a vaccine, wealthy countries and manufacturers imagine that they will be the winners from such bilateral deals. But these arrangements will exacerbate price wars, and will reduce vaccine coverage in many nations to the detriment of all (see, for example, go.nature.com/3mtjcsp). In our globalized world, vaccine nationalism could cost wealthy countries an estimated US$119 billion a year if the poorest countries do not have access (see go.nature.com/36tqeme).

We have witnessed this before. The United States, the United Kingdom and others raced to stockpile oseltamivir, a medication used to treat the H5N1 avian flu pandemic in 2004, to prepare for future pandemics[10]. And at the start of the current pandemic, countries competed to buy scarce personal protective equipment, leading to a global shortage and price increases that crowded out LMICs[11,12].

Although it will be impossible to prevent many wealthy nations from elbowing to the front of the queue, we suggest that international donors, including development banks, should be wary of supporting LMICs in following suit. The World Bank, China's foreign minister and others have already announced loans and financing for poorer countries to procure vaccines. In our view, these risk undermining COVAX.

Measure success

Every vaccination programme should be judged not just by the number of people immunized, but by whether it enables people to live and work safely. This is likely to vary greatly between countries, because each will have different environmental and social factors, and different sub-populations might be selected for priority vaccination. Most nations, for example, are likely to treat health-care workers first. Who gets vaccinated next could depend on the vaccine, demographics (which varies hugely from one continent to another) and many other factors.

Countries should not rely on success measures from other nations, as they have in the past, but should make their own measurements of infection, illness and death rates among vaccinated and non-vaccinated populations. Country-level monitoring and evaluation systems will be crucial. This information will be needed to inform relaxation of mitigation or suppression policies, such as mandatory masking or travel quarantines. Countries should not be lulled into a false sense of security by results reported elsewhere.

We urge global partners and countries to collaborate now to help each other take these five steps towards vaccine readiness.

The authors

Yot Teerawattananon is founder of the Health Intervention and Technology Assessment Program (HITAP), Ministry of Public Health, Thailand; and a visiting professor at the Saw Swee Hock School of Public Health, National University of Singapore, Singapore. **Saudamini Vishwanath Dabak** is head of the international unit at HITAP, Ministry of Public Health, Thailand. e-mail: saudamini.d@hitap.net

Supplementary information accompanies this Comment online; see go.nature.com/3n35gsx

1. World Health Organization. *Draft Landscape of COVID-19 Candidate Vaccines — 29 October 2020* (WHO, 2020).
2. World Health Organization. *Progress and Challenges with Achieving Universal Immunization Coverage. 2019 WHO/UNICEF Estimates of National Immunization Coverage* (WHO, 2020).
3. Williams, S. R. *et al. Am. J. Respir. Crit. Care Med.* **201**, A2146 (2020).
4. Hinman, A. R. & Orenstein, W. A. *Clin. Inf. Dis.* **44**, 1532–1535 (2007).
5. Jha, P. *et al. Strategic Issues to be Considered for the Introduction of COVID Vaccines in South Asia*. An Asia Development Bank Issues Paper (in the press).
6. Dellepiane, N., Pagliusi, S. & Registration Experts Working Group. *Vaccine* **36**, 3389–3396 (2018).
7. Ahonkhai, V., Martins, S. F., Portet, A., Lumpkin, M. & Hartman, D. *PLoS ONE* **11**, e0166515 (2016).
8. Blaschke, T. F., Lumpkin, M. & Hartman, D. *Clin. Pharmacol. Ther.* **107**, 68–71 (2020).
9. Bartsch, S. M. *et al. Am. J. Prev. Med.* **59**, 493–503 (2020).
10. Dyer, O. *Br. Med. J.* **368**, m626 (2020).
11. McMahon, D. E., Peters, G. A., Ivers, L. C. & Freeman, E. E. *PLoS Negl. Trop. Dis.* **14**, e0008412 (2020).
12. Burki, T. *Lancet Infect. Dis.* **20**, 785–786 (2020).