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For more on **vaccine doses administered** see <https://ourworldindata.org/covid-vaccinations>

See Online for appendix

For more on **COVAX** see <https://www.who.int/initiatives/act-accelerator/about>

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A global compact to counter vaccine nationalism

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Vaccine nationalism threatens to turn the triumph of science to give the world vaccines against COVID-19 into tragedy. The success of several initiatives, many funded by taxpayers, to rapidly develop and test several safe and effective vaccines has been nothing short of spectacular. The social promise of SARS-CoV-2 vaccines was to reduce the underlying inequalities by race,

ethnicity, and geography that COVID-19 has both made visible and amplified.¹ Yet, most of the billion vaccine doses administered have been in high-income countries (HICs), with most low-income and middle-income countries (LMICs) left behind (appendix). WHO and Gavi, the Vaccine Alliance have created COVAX to finance SARS-Cov-2 vaccines for LMICs, yet supply of vaccines is still short and coming from only a few companies. India's mostly uncontrolled second viral wave threatens exports of vaccines promised to many countries. The US Government suspending its objections to COVID-19 vaccine patents could help. However, the priority is to produce sufficient quantities on an urgent basis to provide global coverage.

Aspirations to return to some sense of normality might well remain wishful thinking until most adults globally are vaccinated. How do we do that? We propose an integrated three-pillar global vaccine compact to expand vaccine supply and counter vaccine nationalism.

Global vaccine production capacity in non-pandemic times is too small and too concentrated in a handful of pharmaceutical companies.² The first pillar of our proposed compact would be for countries to adopt the idea of a fully immunised adult, and launch national adult vaccination programmes. Using the US Disease Control Priorities Cost Model,³ we estimate that the total cost of routine annual influenza vaccination, 5-yearly pneumococcal vaccines, HPV vaccines for adolescent girls, and tetanus for expectant mothers (including HICs) could be US\$34 billion annually. National governments would need to pay for adult programmes, aided by an expanded mandate for Gavi. Per year, an average of about 1·1 vaccines for 5 billion adults might save one million lives from the targeted diseases. Existing live attenuated vaccines have shown action against multiple pathogens, although COVID-19 trials remain to be done.⁴ These vaccines might prove to be valuable additions to adult vaccination schedules in some circumstances. Analogously, preliminary

data in preprint suggest that annual influenza vaccination reduces the risk of influenza pandemics and perhaps even COVID-19 infection.⁵ Should SARS-CoV-2 vaccination need to be seasonal, adult vaccination programmes establish a delivery platform. Moreover, the world might well be entering the era where major zoonotic diseases are not events that happen once a century but once a decade. Thanks to the Bill & Melinda Gates Foundation and others, the world has endorsed universal access to life-saving vaccines for each of the 125 million children born annually. Adult and child vaccination programmes provide a cost-effective platform to prepare for future pandemics. A far larger market enables dispersed production, incentivises more companies to enter the market, and spurs innovation in vaccine design and delivery.

Next, uninterrupted supply of life-saving vaccines cannot be left only to market forces, or worse—insular political decisions. The second pillar we propose is a global vaccine manufacturing compact housed in less populous countries with good scientific and training infrastructure, a respect for legal contracts, and a reputation for fair play. Canada, Norway, Singapore, and Switzerland are possibilities, as might be several others—some of which are in Africa. The manufacturing compact would produce vaccines in the billions, far in excess of domestic demand. The compact would negotiate licences with vaccine producers but have as its core business model the sale of vaccines very near cost price. An independent governance model using professional business or civil service could counter political interference or cronyism. The facilities can learn from the successful Serum Institute of India, which helps vaccinate many of the world's children at low cost, and from Brazil's Fiocruz public partnership.⁶ We estimate such a manufacturing pillar would cost about \$4 billion to start (with variable running costs that can be priced into sales). It can proceed quickly. The UK was

able to repurpose facilities to produce 100 million of the Oxford–AstraZeneca COVID-19 vaccine in 10 months on a not-for-profit basis,⁷ although it did so, in part, out of concern for post-Brexit European vaccine nationalism.

A third pillar requires rapidly expanding production capacity by private pharmaceutical companies without encouraging the rent-seeking behaviour enabled by patent law.² In theory, the large pharmaceutical companies in the state of California, USA, could meet much of the world's COVID-19 vaccine needs if appropriately incentivised. Cooperation with the private pharmaceutical industry could involve a global funding compact akin to the Japanese model, with taxpayer funding up front in exchange for agreements to produce vaccines in a pandemic. The successful (but sadly defunct) Affordable Medicines Facility for malaria provides lessons on how to constructively engage private sectors.⁸ The compact constitutes an essential global public good, the financing of which are areas of comparative advantage for the World Bank and other multilateral agencies.

The compact is ambitious, and its organisational challenges daunting. Its costs must be compared with an ongoing pandemic that has already killed more than 3 million people, denied essential schooling to billions of children, driven millions of people into poverty, and cost trillions in lost economic welfare.^{9,10} The world must urgently provide an alternative to vaccine nationalism that is delaying the end of the pandemic.

PJ reports funding from the Canadian Immunity Task Force for epidemiological studies. JB works for Oxford University, which has licensed the intellectual property for the ChAdOx1 nCoV-19 vaccine to AstraZeneca with no royalty during the course of the pandemic. JB is co-chairing the G7 pandemic preparedness group on innovative manufacturing, vaccine, diagnostics, and antiviral research and development. DAW and DTJ declare no competing interests.

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Health must be a top priority in the Iran nuclear deal

Unilateral US sanctions against Iran in recent years have been harsh on the health and lives of Iranians.^{1,2} Many scholars have reported that sanctions markedly deteriorate people's health.^{3,4} Restrictions on financial transactions and trade undermine access to basic needs such as food, medicine, and medical supplies. Moreover, the impacts of sanctions on the economy

have decreased the ability of Iranians to pay for life-saving services.

Coping with the COVID-19 pandemic has multiplied the negative impact of the sanctions.^{5,6} Iran is seeing the fourth wave of the COVID-19 pandemic, with a daily death toll of more than 360 people, as of May 13, 2021, according to WHO. Case numbers and mortality might continue to surge given the inadequate vaccination levels of the population. Despite compelling evidence on the harsh effect on health, the sanction-implementing agencies have always stated they did not target people's health and that essential medicines and equipment are exempt from the embargo.

Following President Biden's inauguration, a new round of negotiations on returning to the Iran Nuclear Deal has begun. Two task forces have been defined in the preliminary negotiations: one to return sanctions imposed during the Trump administration and the other to return Iran to the Joint Comprehensive Plan of Action commitments. Experience of previous negotiations has shown that reaching any agreement can take months. One area of mutual agreement is that people's health, as a human right, must be preserved under any sanction regime. Given the impact of current sanctions on citizens' health, immediate action is needed to review barriers to the equitable access of people to medicines and medical supplies.

In parallel with the task force work, we recommend the formation of an additional group to identify immediate measures to reduce the impact of sanctions on health. For example, protecting certain banking channels through specific financial institutions could facilitate the provision of medicines and health-related products. Immediate policies are required to alleviate the negative effects of sanctions to save lives in Iran. Agreements on health should be on a shorter timeline than other disrupted issues that might require longer and more serious negotiations.

For WHO COVID-19 statistics for Iran see <https://covid19.who.int/region/emro/country/ir>



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