clinical-trial participants for years, to assess whether participant-reported outcomes vary if they are reported over the phone rather than in person. He hopes to use that information to gauge the effect of the remote assessments that have frequently been used during the pandemic.

Unger says that SWOG is also looking at metrics for treatment trials, and at whether the data quality has dropped off. "If not, then I do think that you're going to see a lot of these adaptations become permanent," he says.

Lasting changes

Some research centres say that the urgency of the pandemic forced them to accelerate their procedures in ways that will carry over to future trials, regardless of whether changes to official guidelines stay in place. Katherine Tuttle, a nephrologist and executive director for research at Providence Health Care in Spokane, Washington, points out that her centre can now get clinical trials running in a matter of days, rather than having to wait six weeks or more, as was typical before the pandemic. "We're not going back to doing it the old way," she says.

But some negative impacts could also linger. Blanke points to a survey showing that about 20% of cancer survivors are less likely to enrol in a clinical trial than they were before the pandemic (M. E. Fleury *et al. JAMA Oncol.* **7**, 131–132; 2021). "I do worry that there's a core of patients who will not go on a clinical trial for the next five years," he says.

The cutbacks in elective surgeries and other hospital services have also had a lasting effect on the tumour banks that store cancer samples for use in further research, says Bruce Johnson, an oncologist at the Dana–Farber Cancer Institute in Boston, Massachusetts. Johnson specializes in treating lung cancer, and many clinical trials for the disease attempt to match treatments with the DNA mutations present in participants' tumours. "They cancelled elective biopsies," says Johnson. "And so many of our trials are based on them."

Although elective biopsies have restarted, cancer researchers have complained that depleted supplies of patient samples have curtailed basic research.

Over the past few months, Bagiella's team has been coming back to the office, and trials that had been pushed aside to free up resources for COVID-19 are blossoming again. The heart-transplant trial that had been put on hold is enrolling participants.

The pandemic crisis has eased so much that Mount Sinai is struggling to find enough people infected with SARS-CoV-2 to enrol in — and complete — its ongoing COVID-19 trials. "And thank God for it," says Bagiella. She is eager to see the COVID-19 trials close, releasing more resources for studies of other conditions. "It's been a long, long time," she says. "It's good to see some of these trials coming back to life."

COVID VACCINES WON'T REACH POOREST COUNTRIES BEFORE 2023

Vaccine promises from richer nations are not enough to bring an early end to the pandemic, experts say.

By T. V. Padma

Most people in the poorest countries will need to wait another two years before they are vaccinated against COVID-19, researchers have told *Nature*.

Around 11 billion doses are needed to fully vaccinate 70% of the world's population against COVID-19. As of 12 July, nearly 3.5 billion doses had been administered. At the current vaccination rate, this will increase to around six billion doses by the end of the year, say researchers at the International Monetary Fund, based in Washington DC (see go.nature.com/2tchn13).

But so far, more than 80% of the doses have gone to people in high-income and upper-middle-income countries. Only 1% of people in low-income countries have been given at least one dose, according to the website Our World in Data.

Last month, the leaders of the G7 group of wealthy nations pledged extra doses for low- and middle-income countries (LMICs) by the end of 2022, at a summit in Cornwall, UK. The centrepiece was a promise from US President Joe Biden to donate 500 million doses of the vaccine made by pharmaceutical company Pfizer of New York City and biotechnology company BioNTech in Mainz, Germany. This is in addition to 87.5 million doses previously pledged. The United Kingdom pledged 100 million vaccine doses, and France, Germany and Japan have pledged around 30 million each.

China has donated around 30 million vaccine doses to at least 59 countries, according to data published on 2 July by researchers at the Duke Global Health Innovation Center in Durham, North Carolina (see go.nature.com/2udpmos).

Andrea Taylor, a health-policy researcher and the centre's assistant director, says these pledges are unlikely to get more vaccines to the world's poorest people more quickly. In March, her group projected that the world would be vaccinated in 2023; Taylor says that date still stands.

The extra pledges will be offset by restrictions on exports. The European Union and the United States both prohibit exports of some vaccines and vaccine ingredients. The EU is insisting that companies fulfil their pledges to deliver vaccines to the bloc before exporting elsewhere. In February, India, where around six in ten of the world's vaccine doses are made,

EMMANUEL CROSET/AFP/GETTY

COVID-19 testing in Johannesburg, South Africa.

ordered the country's manufacturers to stop exporting COVID-19 vaccines — including to the COVAX initiative, which was established by groups including the World Health Organization (WHO) to distribute vaccines to LMICs. This was a major setback, Taylor says.

COVAX has pledged to vaccinate one-fifth of the population of each LMIC by delivering two billion doses by the end of this year. It has purchased 2.4 billion doses — up from 1.1 billion in March, according to data from the Duke Global Health Innovation Center. But as of 2 July, COVAX had shipped just 95 million doses, up from 65 million in May.

Meanwhile, COVID-19 cases are now surging across Africa. The World Health Organization's Africa office, based in Brazzaville, Republic of Congo, says the number of COVID-19 infections rose by 39% from 13 to 20 June, and by 25% in the week ending 27 June. At least 20 countries, including Zambia, Uganda, South Africa and the Democratic Republic of the Congo, are experiencing a third wave of infections, according to the Africa Centres for Disease Control and Prevention (Africa CDC), based in Addis Ababa. Health facilities are becoming overwhelmed.

Behind schedule

Pharmaceutical company AstraZeneca, based in Cambridge, UK, is one of COVAX's main sources of vaccine doses. In June 2020, the company signed a deal with the Serum Institute of India (SII) in Pune, one of the world's largest vaccine makers, to manufacture one billion doses of the vaccine that the company developed with the University of Oxford, UK, and send them to LMICs. Of these, 400 million doses were to be provided before the end of 2020.

But infections began to resurge in India's second wave in March. The government's order that the SII divert all vaccine supplies to meet domestic demand has hit COVAX particularly hard.

By the end of March this year, COVAX had received just 28 million doses of the AstraZeneca–Oxford vaccine. It was due to receive another 90 million by the end of April; these are now on hold.

Overall, between February and May, African countries received only 18.2 million of the 66 million doses they had expected through COVAX. Out of nearly 1.3 billion people in Africa, just 2% have received one dose of a COVID-19 vaccine. And a little over 1% — 26 million people — are fully vaccinated, according to the WHO's Africa office.

An SII spokesperson told *Nature* that the company expects to resume global exports by the end of 2021. A COVAX spokesperson says that in spite of the delays, the organization is confident that it can meet its goal of supplying two billion doses by the end of the year.

The African Union is, meanwhile, exploring other options. With financial help from the World Bank, it has secured 400 million doses of the single-shot vaccine developed by pharmaceutical company Johnson & Johnson, based in New Brunswick, New Jersey.

"Let me put it bluntly, we are not winning in Africa this battle against the virus so it does not really matter to me whether the vaccines are from COVAX or anywhere. All we need is rapid access to vaccines," said Africa CDC director John Nkengasong at a briefing at the end of last month.

Individual African countries are also negotiating deals with vaccine companies to fill the hole left by the SII. But these countries are often at the back of the queue, Taylor says, because they lack the purchasing power of richer countries.

Vaccines needed now

With India's manufacturers out of the picture for now, the United States is emerging as the world's leading supplier of vaccine doses to LMICs, Taylor explains, and has begun to distribute some of its surplus supplies.

However, according to WHO chief scientist Soumya Swaminathan, this could be too late. "The inequitable distribution of vaccines has allowed the virus to continue spreading," she says. Unvaccinated populations are already at risk, especially from new coronavirus variants, such as Delta (also known as B.1.617.2). "We need countries with substantial supply to donate 250 million doses for September," Swaminathan says.

The WHO is calling on its member states to support a huge effort to vaccinate at least 10% of people in every country by September, along with a "drive to December" to vaccinate at least 30% by the end of the year. This will happen only if countries immediately share doses with COVAX and if manufacturers prioritize COVAX orders, Swaminathan says.

The timing is extremely important, adds Taylor. "Doses shared now will be so much more impactful than doses in six months. We need wealthy countries to send doses immediately."

WILL COVID BECOME A DISEASE OF THE YOUNG?

Rising infections among unvaccinated teenagers and children are highlighting their role in the pandemic.

By Smriti Mallapaty

On 21 June, Israel's Ministry of Health recommended that all individuals aged 12–15 be vaccinated against COVID-19 — making the nation one of the few to approve vaccinations for adolescents. The decision came in response to a trend that many countries with high vaccination rates are experiencing: an ever-increasing proportion of new infections are in younger people (see 'Trending younger').

Israel's swift vaccination campaign — which has reached more than 85% of the adult population — saw case numbers drop to around a dozen a day in early June. But later that month, cases rose to more than 100 a day, many in people under 16, leading the government to open up vaccinations to all those aged 12 and above.

The younger profile of infected people is not surprising, says Ran Balicer, an epidemiologist at Israel's largest health-care provider, Clalit Health Services in Tel Aviv. But it highlights the possibility that subsequent waves of community spread could be driven by younger age groups, especially in the presence of more-transmissible variants.

It's a trend that's not restricted to Israel. In the United States and the United Kingdom, COVID-19 has "become a disease of the unvaccinated, who are predominantly young", says Joshua Goldstein, a demographer at the University of California, Berkeley.

This shift is occurring in many countries that vaccinated older people first, and are now reaching high levels of vaccination in adults. It follows an earlier drop in the age profile of infected people as a result of public-health measures to prevent the spread of COVID-19 among older people who are most at risk of severe disease, such as those in nursing homes, say researchers.

And the shift has brought fresh impetus to studies of transmission and disease in younger age groups. To make better policy decisions, "it's becoming more and more important to understand the burden of disease among children and adolescents", says Karin Magnusson, an epidemiologist at the Norwegian Institute of Public Health in Oslo.

Magnusson has looked at the impact of COVID-19 in children on Norway's health-care system. In a 5 June preprint, she reported that although they didn't need specialist care,