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.

the incidence of *P falciparum* malaria was 30% lower in the intervention group, but the benefits were transient. In the third year of follow-up, the prevalence in the control group fell to 2·7%, whereas in the intervention group it rose to 2·8%.

The study confirms that in remote communities, deployment of community health workers, early diagnosis and treatment of malaria, and distribution of long-lasting insecticidal bed-nets can reduce the burden of malaria substantially.[5] MDA accelerated the reduction in *P falciparum* infections but the intervention was intense, involving extensive community engagement, three rounds of a supervised 3-day regimen, active case detection, and screening of newcomers to the community. Was it worth it?

The overall effectiveness of MDA depends on both community coverage and preventing reintroduction of infection. Although 90% of the population in the intervention clusters completed at least one round of MDA, only 77% participated in all three rounds. This level of coverage might have been insufficient, with residual infections sustaining ongoing transmission. An important limitation of the study was the relatively small sample size and the proximity of control and intervention clusters. Highly mobile populations of asymptomatic individuals will contaminate the magnitude of the effect of MDA, increasing re-importation of infection into the intervention clusters. Regional implementation of MDA with high levels of coverage have a more profound and longer lasting benefit, as has been shown in Vanuatu, Comoros, and China.[6–8]

The key decision now is whether the results of recent large MDA trials, including the one by McLean and colleagues, warrant larger scale interventions.[9,10] The approach will need to be tailored to specific settings, including targeting high-risk populations and isolated communities, repeating MDA at regular intervals, and consideration of the radical cure of *Plasmodium vivax*. These decisions will require bold national and international leadership, as well as a sense of urgency if the spread of resistance is to be curtailed and elimination targets met.

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Assessing the effect of BCG revaccination on long-term mortality

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Vaccination is one of the most effective and efficient public health interventions of the past two centuries, with organisation of national vaccination programmes around the world being associated with significant decreases in mortality, especially mortality due to infections.[1] Vaccines are designed to induce heightened specific humoral (memory B cells producing specific antibodies) and cellular (memory T cells) responses against specific pathogens that upon reinfection ensure a rapid elimination of an infection. However, increasing evidence accumulated since the mass vaccination programmes of the 20th century suggest


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that some vaccines, especially those derived from live attenuated microorganisms, also have important beneficial heterologous effects outside the target disease. Probably the vaccine that has been most studied in relation to its protective heterologous effects is BCG, which was developed 100 years ago against tuberculosis.[2]

In *The Lancet Infectious Diseases*, Judith Glynn and colleagues[3] report findings on the long-term effects of BCG revaccination on mortality in adults of various ages, providing an important piece of the complex puzzle of the broad effects of BCG vaccination. The strength of the study is its use of well balanced randomisation, with BCG revaccination (or placebo) administered in a large population of older children and adults living in Malawi. Despite long-term follow-up of 8 and 30 years in the two cohorts investigated, no effect of early BCG revaccination was shown. The study seems thus to exclude a long-term effect of BCG on mortality in this setting, which is important information about the limitation of BCG heterologous effects.

However, it is also important to highlight the conclusions that cannot be extracted from this study. First, the data collected by Glynn and colleagues do not permit clear distinction of effects in the initial 1–2 year interval after revaccination due to the very low number of deaths in this period and thus the lack of power. Indeed, the effects of BCG on mortality in infants have been shown to be strongest in the immediate period of weeks or months after BCG vaccination.[4] In line with this, the putative immunological mechanisms responsible for these protective effects of BCG are the induction of heterologous T-cell immunity and innate immune memory (also termed trained immunity), both of which have a short duration of 1–2 years.[2,5] Second, as the authors also acknowledge, there was only a small number of deaths due to communicable diseases in the studied cohorts. Therefore, non-infectious mortality could have obscured any effect of BCG vaccination on infectious mortality, which would be the most likely expected potential effect. Further studies are therefore needed to assess the potential long-term effects of BCG revaccination on mortality due to infections in adults and older people. Additionally, although a long-term effect on mortality seems to be excluded, no information is available in this study on the effects of BCG vaccination on morbidity.

The absence of an effect on overall mortality by BCG revaccination observed by Glynn and colleagues is in line with other studies in the literature, as reviewed by the authors.[3] However, not all previous studies indicate a lack of effect, as Glynn and colleagues also acknowledge and discuss. In addition, some studies were not reviewed by the authors because they assessed long-term effects of first BCG vaccination, rather than revaccination: these studies do seem to suggest potential decreased mortality in older children and adults aged up to 45 years, if previously vaccinated with BCG.[6] In line with this, some large epidemiological studies suggest reduction of cancer prevalence in individuals vaccinated with BCG,[7] which could suggest an important protective effect of BCG, in addition to prevention of infections, that might explain a potential effect on mortality in some populations. Indeed, BCG-induced activation of immune responses is routinely used in bladder cancer treatment, and has been suggested for other types of malignancies.[8]

Glynn and colleagues initiated their study to provide arguments for the usefulness (or not) of BCG vaccination or revaccination in adults as a preventive measure against COVID-19. This approach has been proposed on the basis of earlier studies showing a decrease of viraemia[9] and prevalence of respiratory viral infections[10] in adults vaccinated or revaccinated with BCG, with more than 15 ongoing randomised trials. Glynn and colleagues suggest that such an approach is not supported by the current study, yet acknowledge that no conclusions can be made about the short-term (1–2 years) effects of BCG on infection morbidity and mortality. Indeed, the answer to the question regarding the short-term effects of BCG vaccination on COVID-19 can be given only by the ongoing trials that are awaited with interest.

In conclusion, the study by Glynn and colleagues is an important investigation showing that BCG revaccination in an adult African population does not have an important effect on long-term overall mortality. Because other studies suggest beneficial effects of BCG vaccination in other populations, this should stimulate large epidemiological investigations that could give a definitive answer regarding the effects of BCG vaccination on mortality in adults of different ethnicities, demographics, and geographical locations. Finally, as new data accumulate on short-term

protective effects of BCG vaccination on infections,[10] randomised trials are warranted to establish the validity and strength of such effects.

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India's COVID-19 vaccination drive: key challenges and resolutions

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India has been gravely struck by the second wave of COVID-19[1] caused by SARS-CoV-2, and is predicted to be hit by the third wave in the next few months. It is challenging for the Government of India to implement a mass vaccination drive while mitigating the subsequent COVID-19 waves. Recommendations for the second wave of COVID-19 in India have been described elsewhere.[2] Here, we highlight challenges and resolution measures for mass vaccination of the second-most populous country in the world.

India sustains a staggering 17·7% (1·39 billion) of the world's population, and vaccine production has therefore been a challenge in the country. India has three vaccines (Covishield [ChAdOx1 nCoV-19; Oxford–AstraZeneca; manufactured by Serum Institute of India], Covaxin [BBV152; Bharat Biotech], and Sputnik V [Gam-COVID-Vac; Gamaleya Research Institute of Epidemiology and Microbiology]) approved for emergency use. Around 70 million Covishield doses and 10 million Covaxin doses per month have been manufactured in India up to May, 2021.[3] This production pace is insufficient to cover the enormous population of India; hence, manufacturers have committed 100 and 80 million doses per month, respectively, in the coming months. Indian Immunologicals will also provide 10–15 million doses of Covaxin per month by August–September, 2021.[3] Besides national production, the country should also consider importation to achieve mass vaccination quickly.

Vaccination planning has also been a challenge in India. Earlier in the year, individual Indian citizens had to register on the CoWIN or Aarogya Setu portal in order to receive a COVID-19 vaccination. The limited number of vaccination slots resulted in fewer administrations during the initial 5 months of the vaccination programme (phase 1–4). The Government of India has now amended the vaccination policy by waiving the preregistration requirement and offering free vaccinations to accelerate the programme. However, mass gatherings at health-care settings might lead to a further surge in daily cases. Door-to-door vaccination might be a feasible and safe solution to avoid such assemblies.

The COVID-19 vaccine drive in India was launched on Jan 16, 2021. From May 1, 2021, all people older than 18 years are eligible in phase 4 of the vaccination drive. By July 20, 2021, 326·4 million people in India (23·4% of the population) had received the first dose of the vaccine, and 85·4 million people (6·1% of the population) had received the second dose.[4] At the current pace, it would not be possible to vaccinate the whole nation by the end of 2021. The Government of