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## COVID-19 and other adult vaccines can drive global disease prevention



The COVID-19 pandemic has led to a renewed recognition of the importance of disease prevention and public health globally. The progress in COVID-19 vaccine technology is a small portion of the pipeline of new vaccines and injectable therapies that could prevent leading causes of premature death and disability. This pipeline comes from decades of investment by governments and work by pharmaceutical companies, academic researchers, and new entrants in the field. The urgent need for new COVID-19 vaccines has also accelerated developments in this pipeline. Mirroring success during the past 50 years with the Expanded Programme on Immunization for children, global life course vaccination and other preventive strategies that use these products would strengthen health systems globally and have a major impact on disease prevention.

In the adult vaccine space, new products at multiple stages of preclinical and clinical development for coronaviruses, influenza, and respiratory syncytial virus (RSV) are expected to emerge in the coming months and years.<sup>1-3</sup> These could become staple products for reducing adult disease burden, particularly in winter. Although the global burden of these diseases is difficult to estimate due to insufficient data in many countries, it is likely to be considerable. For example, estimates suggest that influenza causes 389 000 deaths annually, with the majority of cases in southeast Asia, the Western Pacific region, and sub-Saharan Africa, and that at least 14 000 hospital-based deaths are caused by RSV acute respiratory infection globally, although this is likely to be an underestimation of total deaths from RSV.<sup>4,5</sup> As durability of vaccine-induced immune response is likely to remain a challenge, an annual immunisation cycle for these infectious diseases is possible and would have real population-level health benefits.

If COVID-19 and influenza booster doses become the mainstay of annual adult immunisation programmes, other innovative products could be used alongside them. Vaccines in development for tuberculosis and malaria, for example, have promising phase 2 data, with efficacy of up to 50% against tuberculosis and 80% against malaria in children.<sup>6,7</sup> Although malaria burden in children is substantial, evidence suggests that its burden

in adults is underestimated,<sup>8</sup> and a malaria vaccine with encouraging phase 2 data is now being tested in adults (NCT05252845). Existing human papilloma virus and pneumococcal vaccination programmes still do not reach all the populations they should.<sup>9,10</sup> A vaccine for dengue fever received its first approval for use in Indonesia in August, 2022.<sup>11</sup> Additionally, new long-acting preventive injectable therapies might be administered by health-care workers in the future—eg, small interfering RNA (siRNA) that prevents translation of PCSK9 for atherosclerotic cardiovascular disease prevention, or the siRNA anti-hypertensive that targets angiotensinogen, if its efficacy is confirmed in ongoing trials (NCT04936035).<sup>12,13</sup> Long-acting injectables for HIV prevention and antipsychotic treatment could similarly have the potential to become part of preventive strategies.<sup>14,15</sup> Administering each product individually would be challenging due to high delivery costs and prices, especially in low-income and middle-income countries (LMICs). However, bundling delivery could reduce the per unit cost of administration by using shared resources, such as supply chains and health-care workers, for multiple products, and instituting tiered pricing would make these products more affordable for countries with constrained health budgets.

Governments and industry have begun building new manufacturing capacity to avoid vaccine inequity. Before the COVID-19 pandemic, the world produced and procured about 5 billion vaccine doses annually.<sup>16</sup> In 2022, the world has the capacity to manufacture more than 25 billion doses of approved COVID-19 vaccines, and most production is concentrated in China, the EU, India, and the USA.<sup>16,17</sup> Sustainable, scaled, and globally distributed manufacturing would improve the response to future pandemics. As new manufacturing sites are established, coordinated demand forecasts and adoption of routine vaccinations at scale could keep these factories commercially viable so that they are available for the next pathogen outbreak.

The COVID-19 pandemic highlighted the role of community-based and primary care sites to deliver vaccines and to build reliable cold chains. There is potential to integrate more preventive health services



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into a single point of care, reducing the need for vertical systems that focus on single diseases. Indeed, in 2019, two-thirds of global health funding to LMICs focused on HIV, tuberculosis, malaria (which historically have not benefited from long-acting pharmacological preventive technologies), and reproductive, maternal, newborn, and child health.<sup>18</sup> Addressing these patient populations is important and funding should be sustained, but there should also be increased focus on prevention strategies for other adult diseases. These strategies should consider variations in available financing, service delivery, public health infrastructure, disease burden, vaccine acceptance, and other factors across countries.

The digitisation of health systems accelerated during the COVID-19 pandemic, and digital tools identified and prioritised individuals for vaccination, recruited them to sites, and in some settings linked vaccination data to health records with a unique identifier. Before the pandemic, about 60% of LMICs did not have electronic immunisation registries.<sup>19</sup> Digitisation is key to successful vaccine roll-outs, and pressure to build this infrastructure during the pandemic led to considerable progress. This infrastructure will be particularly important given the need for multiple vaccines, repeat boosters, and diagnostic tests for many vaccines or injectables. Not all high-income countries achieved this infrastructure, but those that did created some of the best datasets and real-world evidence on COVID-19 vaccine safety and efficacy.<sup>20,21</sup> Many LMICs have or are developing digital health systems that provide a powerful starting point for scaling digitally enabled primary care and public health. Global health funders and governments should require and prioritise digital infrastructure to deliver, track, and measure the impact of adult vaccines, injectables, and other interventions. This approach would enable systems to not only record clinical encounters, but also to collect longitudinal data on demographics, clinical outcomes, and side-effects (including in clinical trials) in a privacy-protected way. This digital infrastructure would facilitate the most effective use of new vaccines and injectable therapies that could transform the prevention agenda and improve pandemic preparedness.

The importance of a prevention strategy that capitalises on innovations for infectious and chronic diseases and strengthens health systems is clear, as highlighted in two 2022 reports, *A Global Opportunity to Combat Preventable Disease: How to Use COVID-19*

*Infrastructure to Transform Public Health Worldwide*<sup>22</sup> and *One Shot to Prevent Disease and Prepare for Future Pandemics*.<sup>23</sup> Vaccines and preventive injectables that are available or in development could prevent 10 million deaths each year.<sup>22,23</sup> A global adult disease prevention programme, supported by geographically distributed manufacturing and digitally enabled cold chain, service delivery, and recording, could have profound implications for health worldwide between disease outbreaks and also create the systems to respond to future pathogen threats. Governments, funders, the private sector, and partner organisations need to overcome siloed efforts to deliver this programme as a positive global legacy of the COVID-19 pandemic.

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