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Quantifying the Social Value of a Universal COVID-19 Vaccine and Incentivizing Its Development

Based on BFI Working Paper No. 2024-05, "Quantifying the Social Value of a Universal COVID-19 Vaccine and Incentivizing Its Development," Rachel Glennerster, University of Chicago; Thomas Kelly, 1Day Sooner; Claire T. McMahon, University of Chicago; and Christopher M. Snyder, Dartmouth College

A universal COVID-19 vaccine that is effective against existing and future variants could provide the United States population with $1.5–$2.6 trillion more in social value than variant-specific boosters. The social value of a universal vaccine eclipses the cost of incentivizing manufacturers to develop it.

In the nearly four years since the emergence of the COVID-19 pandemic, vaccines have been a key medical countermeasure. Against the original strain, vaccines proved highly effective in preventing infection, hospitalization, and death. Since then, continuous mutations of the virus have caused the efficacy of the original COVID-19 vaccine to wane, and the United States has adopted a strategy of developing variant-specific booster vaccines. Given the ongoing risk of future waves of COVID-19 caused by new variants, this paper makes the case for a universal COVID-19 vaccine that would be effective against existing and future variants.

The authors begin by evaluating the benefits of a successful universal COVID-19 vaccine compared to variant-specific boosters. They construct a model to compare the forecasted number of deaths from COVID-19 under two scenarios. Scenario A models the United States' current COVID-19 vaccination strategy where vaccines are reformulated annually and the arrival of a new variant wave sparks the development of a variant-specific booster. In Scenario B the development of a universal vaccine begins immediately. While in Scenario A the booster may or may not arrive in time to mitigate much of the mortality from a new variant wave, under Scenario B, there is a greater

chance that people can be effectively immunized before the new wave peaks.

The authors apply this framework to a projection of future COVID-19 mortality based on historical data from the United States Centers for Disease Control and Prevention (CDC) on COVID-19 variants and deaths. The model assumes a **steady-state background death toll** will continue until the random arrival of the emergence of a new **variant of concern**, the successful development of a universal COVID-19 vaccine, or the end of COVID-19. They average results across 100,000 simulations and compare the likely mortality outcomes under Scenario A and Scenario B, and find the following:

- The social value of a universal COVID-19 vaccine to the United States population is $1.5–$2.6 trillion greater than that of variant-specific boosters.

Building on these results, the authors next propose an advanced market commitment (AMC) to incentivize manufacturers to develop a universal COVID-19 vaccine. An AMC is a commitment by donors to guarantee a market for certain vaccines by pledging to purchase it or fund its purchase for the target population once it has been developed and approved. In the case of a universal COVID-19 vaccine, the authors argue that a pledge from the United States federal government or some other consortium of funders to buy courses of a universal COVID-19 vaccine at a pre-specified price would bolster manufacturers' incentives to invest in their research, development, and manufacturing capacity. The incremental benefit of increased investment can be interpreted as increasing the probability a successful vaccine is developed or accelerating the development timeline, as shown in Figure 1.

The authors estimate that an AMC for a universal COVID-19 vaccine would cost roughly between $4.7 and $6.4 billion. Comparing this cost to the benefit of a universal COVID-19 vaccine as described above, the authors conclude that **the cost of an AMC for a universal COVID-19 is eclipsed by the vaccine's massive social benefit.**

The upshot is that a universal COVID-19 vaccine could have substantial social benefits. The more conservative estimate of $1.5 trillion is based on the optimistic assumption that COVID-19 is very unlikely to have major future waves and does not account for additional harm from the cost of illness, loss of classroom time, losses of economic output, and so forth. Under a less conservative assumption where COVID-19 waves continue to arrive regularly, the benefit of a universal vaccine rises to $2.6 trillion relative to the status quo. Either way, the launch of an AMC for a universal COVID-19 vaccine offers the possibility of an enormous return on investment and the chance to save many lives in the United States and even more lives across the globe.

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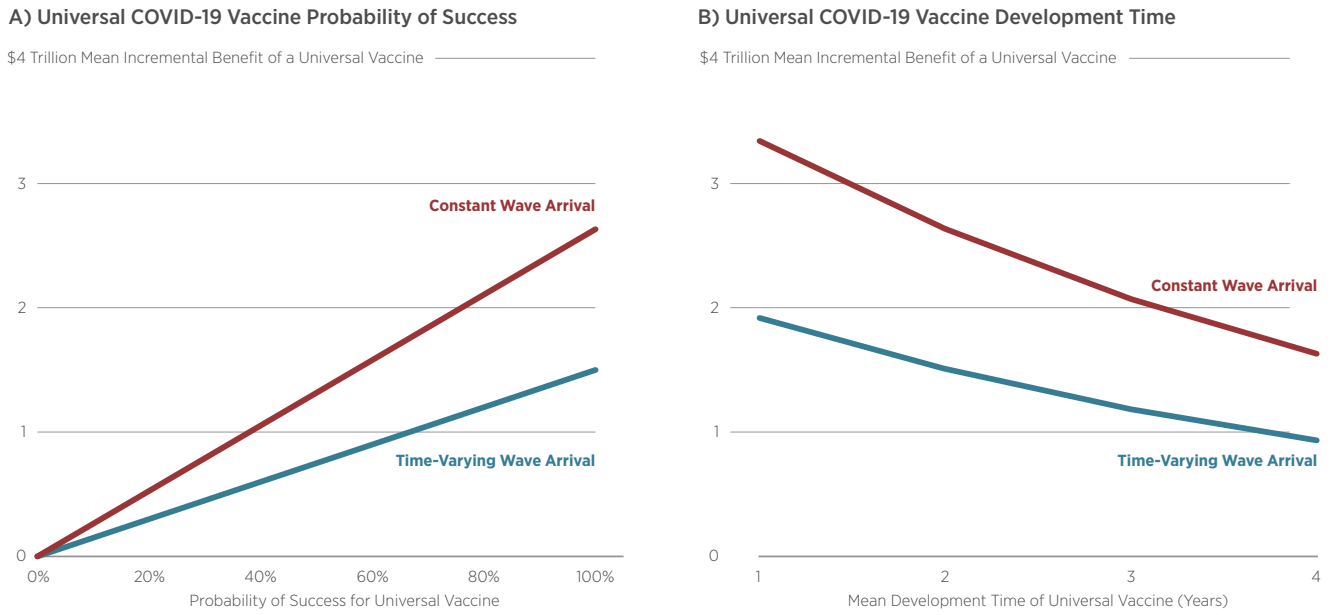
Steady state background death toll: the number of deaths from COVID-19 that occur outside the event of a new variant wave

Variant of concern: a technical designation, reflecting a new COVID variant's increase in transmissibility, more severe disease (for example, increased hospitalizations or deaths), significant reduction in neutralization by antibodies generated during previous infection or vaccination, reduced effectiveness of treatments or vaccines, or diagnostic detection failures

Social benefit: the positive impact of an action, policy, or project on society as a whole. Unlike private benefits, which accrue directly to an individual or a specific organization, social benefits are broader and often affect a large segment of the population or the entire community. In this research, the authors measure the social benefit from reduced mortality.

Figure 1 · Incremental Benefit from an Advanced Market Commitment (AMC) for a Universal COVID-19 Vaccine



Note: Panel A plots the incremental benefit of a universal COVID-19 vaccine as a function of its probability of success. Panel B plots the incremental benefit of a universal COVID-19 vaccine as a function of its mean development time from simulations that model the vaccine's development timeline as a **Poisson random variable** with the mean development time along the x-axis.

Poisson random variable: a type of statistical distribution that is used to model the number of times an event happens in a fixed interval of time or space

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