It may be less cost-effective to vaccinate—and thus to procure doses for—only a subset of a population in countries where the rate of vaccination is low, because infection will spread to more people, reducing the incremental value of vaccination; that is, the social value of vaccination and the optimum number of doses to purchase rise with the rate of vaccination.

Prior analyses of optimal vaccine allocation typically begin with a model of disease, then simulate or forecast the effect of various vaccine allocation plans, and finally compare plans based on certain metrics. The authors cite numerous studies that incorporate various features, from prioritization of elderly populations, to accounting for deaths averted and years of life saved, among other factors. This research builds on those prior evaluations of vaccine allocation in three important respects: it includes novel epidemiological data from...
a low-to-middle income country, India; it incorporates a robust economic valuation of vaccination plans based on willingness to pay for longevity; and—more importantly—it employs a model for social demand for vaccination that can guide governments’ vaccine procurement decisions.

Among other findings, this work reveals the following:

- **Allocation matters.** In countries such as India, with large populations and vaccine shortages, it matters who gets the vaccine first. Mortality-rate based prioritization may save a million more lives and 10 million more life-years.

- **The social value of vaccination and the optimum number of doses to purchase rise with the rate of vaccination.** It may be cost-effective to vaccinate—and thus to procure doses for—only a subset of the population if the rate of vaccination is low because vaccination campaigns are in a race against the epidemic. Slower vaccination means more people obtain immunity from infection, reducing the incremental protection from—and thus the social value of—vaccination.

- **However, if the cost of speeding up vaccination is the inability to prioritize, it may be prudent in countries like India, for example, to choose a slower but mortality-rate prioritized vaccination plan.** Vaccinating just 25% of the population in a year using mortality-rate prioritization saves more lives and life-years than vaccinating even 100% of the population in 6 months using random allocation. Protecting a small number of the elderly eliminates much of the remaining mortality risk from COVID-19 in India.

- **A substantial portion of the social value from vaccination comes from improvement in consumption when vaccination reduces cases and permits greater economic activity.**

This paper presents tools that can provide actionable policy advice, with estimates to help governments select optimal vaccination plans on a range of metrics. Importantly, these metrics consider economic factors that influence politicians, even though they may not be what the public health community recommends. Most importantly, these estimates recommend how many doses would be cost effective for governments to procure at different levels of vaccine efficacy and price.