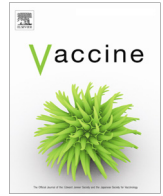




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## Commentary

## Allocation criteria for an initial shortage of a future SARS-CoV-2 vaccine and necessary measures for global immunity

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Although healthcare systems around the world currently are fully absorbed with the day-to-day challenge of slowing down the spread of the SARS-CoV-2 virus, ongoing research makes it very likely that a protective vaccine will be developed within a rather short period of time [1,2]. It appears obvious that such a vaccine will not be available *ad libitum* right from the beginning [3], but rather that an initially short supply will meet a huge and desperate worldwide demand.

Although we currently enjoy impressive examples of individual generosity and altruism in the wake of the crisis, we should not overstate the role of philanthropic actors, as it is still primarily governments that invest in fundamental research. Any shortage of vital goods bears severe ethical challenges, as it generates distribution conflicts that can amount to antisocial behavior at the individual as well as at the governmental level, such as bribery, black markets, or protectionist trading practices. If we do not want to face scenarios as epitomized by Graham Greene in “The Third Man” for penicillin after World War II [4], we are well advised to equip ourselves with reasonable and transparent criteria for the allocation of a foreseeably scarce vaccine as long as it will not be readily available for everybody. Given the unprecedented public attention to the issue, these criteria must be medically adequate, socially fair, transparent, verifiable, and easily understandable for non-experts, in order to bridge the - hopefully short but anyway relevant- initial shortage of vaccine supply without creating social discomfort or even unrest. The recent promising data on antiviral therapies or convalescent plasma treatments for already affected patients may at best alleviate the pressure a bit [5], yet not resolve the problem as a whole. What is more, it is still unclear how long the post-infection immunity of convalescents will last [6].

As current data clearly show that COVID-19 mortality is strongly associated with age [7], it should be the leading and also easily verifiable medical parameter for the distribution of the expected vaccine during an initial scarcity. However, it goes without saying that a few specific groups of professionals must be preferred as recipients in the interest of all, namely medical and security personnel immediately involved in the fight against the pandemic. The general rule should be that those who are most

needed come first, followed by those most in need. Accordingly, the following preference list might be reasonable:

Rank 1: Physicians and nurses in immediate patient care, plus police and comparable public security officers in immediate contact with the general public. High-ranking policymakers or security officers may argue that they are indispensable for societies as well, but as there is no sharp definition for that kind of functional importance, any subjective assignment of professional preference will be sure to diminish the societal acceptance of the chosen ones.

Rank 2: Documented recipients of organ transplants under ongoing immunosuppressive medication. It might be argued that other patients receiving immunocompromising therapies can be equally endangered, but any openness to other medical indications beyond transplantation will likely give rise to illegitimate attempts of circumventing the restrictions.

Rank 3: All other persons, ordered by date of birth from old to young, without any exception, and most notably, irrespective of insurance status. Although it is a well-known yet not universally accepted fact that the prosperous and well-insured have access to higher quality healthcare, social inequality in the struggle against a challenge that is obviously equal to all will most likely elicit strong adverse reactions even among otherwise indulgent patients.

Admittedly, this strict allocation scheme may neglect relevant medical and epidemiological issues such as reduced vaccine efficacy among immunocompromised persons [8] and among the elderly due to immunosenescence [9], as well as the fact that schools and universities are major hotspots of transmission [10]. However, any granularity in the criteria would render them less transparent and actionable.

Beyond this ranking, anti-bribery rules will have to be rigidly enforced, and illegitimate vaccine sales pathways such as cryptomarkets [11], be they real or fake, vigorously prosecuted. Political precautions should also be taken against cross-border buy-outs of vaccine stocks or manufacturers [12]. After having overcome the expected initial shortage of vaccines, the global community must take appropriate measures to rapidly generate a worldwide herd immunity against SARS-CoV-2 through implementing mandatory, or at least free of charge to all, vaccination programs encompassing all countries and age groups. The WHO is uniquely experienced and equipped to meet that ambitious challenge, and any political

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attempt to weaken it in this critical situation is, to say the least, counterproductive. Any person left behind for whatever reason will not only be in avoidable peril, but will also put the goal of eradication of SARS-CoV-2 at risk [13]. Therefore, the EU and other well-heeled supranational organisations should feel not only morally obliged but also pragmatically well-advised to participate in supplying weaker healthcare systems with sufficient amounts of vaccine and logistic support for their application even in remote areas [14].

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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