COMMENTARY

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Allocating Vaccines in a Pandemic: The Ethical Dimension

Clinical trials to identify a safe and effective vaccine for COVID-19 (severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) are presently underway. Upon completion, an all-consuming, simultaneous worldwide demand is bound to follow. How should a limited supply of vaccines be fairly allocated? Which ethical values should guide these decisions? How can apparent clashes between different ethical values be mitigated?

These questions require serious consideration. Similar dilemmas of allocation arose in the face of shortages of N95 respirator masks, ventilators, and hospital beds.[1] However, the fair allocation of vaccines presents an even more complicated set of challenges. The objectives of vaccination are 2-fold. One is the direct protection of the vaccinated individual against future infection and its associated health consequences. The other is the indirect protection of the population at large by reducing overall viral transmission and, thereby, the risk of infection, even for those who have not been vaccinated. When a sufficient number of individuals becomes immune to infection such that the disease no longer spreads, the population is said to have achieved herd immunity. Whereas ventilators or hospital beds only benefit the individual recipient, a vaccine's benefits extend to those yet to be vaccinated as well. It follows that a vaccine distribution program must be prepared to achieve both of these direct and indirect aims.

Under some circumstances, the aims of conferring direct and indirect benefits coincide. This concordance may well apply to health care professionals by dint of their high levels of exposure to the disease and their capacity to act as disease vectors. Not surprisingly, this ethical convergence is in line with the guidelines issued by the Centers for Disease Control and Prevention (CDC) for the allocation of vaccines during an influenza pandemic.[2] How, though, should one decide the relative priority of other potential beneficiaries?

Two key issues in the ethics of vaccine distribution are worth highlighting. The first concerns the currency of what should be distributed. At first glance, it may seem obvious that the answer is vaccines. However, consider a highly stylized question of whether one should prioritize 8-year olds or 80-year olds for vaccination. In the case of influenza, school-aged children are underrepresented among influenza-associated hospitalizations and deaths but are disproportionately responsible for the transmission of the virus. Consequently, prioritizing children for influenza vaccination over those at higher risk of harm, such as the elderly, may lead to a greater overall reduction in mortality.[3] Unlike the individual benefits afforded by ventilators, the benefits of vaccines are communal in the sense that vaccinating 1 individual confers benefits on other members of the community as well. What is to be fairly allocated, then, is not the vaccines per se but, rather, the *benefits* thereof.

The second ethical issue concerns how to distribute the benefits of vaccines fairly. Maximizing benefits is a commonly invoked value to guide allocation.[1] For example, guidelines for the allocation of scarce ventilators give preference to saving the most lives overall by prioritizing patients who are most likely to survive to hospital discharge. In this scenario, saving patients who are most likely to benefit from the intervention will also result in the greatest overall number of lives saved. However, as discussed previously, prioritizing those individuals who are most likely to directly benefit from vaccination, such as older adults, may not maximize the overall number of lives saved. Allocating vaccines to those most responsible for the transmission of COVID-19 may confer more benefit to the population at large. Allocation guidelines must balance the obligation to assist individuals most likely to benefit against the obligation to secure the greatest aggregate benefit across the population.

In addition to maximizing benefits, allocation guidelines should also be informed by considerations of fairness. For example, fair allocation of vaccine benefits must take into account existing health inequities. Individuals burdened by comorbidities such as asthma, heart disease, and diabetes

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appear to be at increased risk of contracting severe illness from COVID-19. Unfavorable social determinants may likewise predispose to severe COVID-19 complications. There may thus be 2 arguments in favor of prioritizing vulnerable groups for vaccination: because members of such groups are most likely to benefit and because of justice-based imperatives to address health inequities. Equity concerns are further complicated because fairness involves not merely ensuring a fair distribution of outcomes but also a fair distribution of chances. In this respect, there may be a role for using random selection to guide vaccine allocation. For example, if the vaccine supply is limited for individuals in a certain risk category, then random selection through a lottery may be justified.[1]

Better stratification of the population risks of COVID-19 may mitigate some of these ethical dilemmas. This paradigm entails the identification of the settings or subpopulations that disproportionately transmit the virus and the individuals who are most likely to suffer severely if infected. For example, recent models suggest that crowding and population density constitute important variables in determining the devastation from COVID-19.[4] Crowded areas not only increase the risk of spread but may also affect the fatality rate. Models of the 1918 Spanish flu epidemic suggested a close association between the severity of the illness and the infectious dose to which a person was exposed. Were the same relationship to be established for COVID-19, then an argument could be made for prioritizing the vaccination of individuals in densely populated areas so as to maximize both the direct and indirect benefits of the vaccine. Hence, epidemiological research could help align the aims of maximizing population benefits and of assisting individuals most likely to benefit.

Ultimately, vaccine allocation criteria will need to be formulated in concert with other health policies. A key aspect of such an undertaking will likely be a program for testing and surveillance so as to identify individuals most likely to transmit the COVID-19 infection. For example, if antibodies are determined to provide protection against further infection and transmission of COVID-19, then vaccines could be allocated accordingly. It will also be necessary to consider how the transmission dynamics intersects with restrictive measures and broader ethical questions. For example, keeping schools closed may lessen the imperative of vaccinating the young, rather than the old, but this policy also deprives children of educational opportunities, thereby raising further issues around fairness and equality.

Proposals to accelerate vaccine development, such as human challenge trials wherein consenting volunteers are deliberately infected, may shorten the timeline to vaccine distribution. However, the standards for regulatory approval must remain high. Because vaccines are distributed to healthy individuals, a high ethical standard must prevail for ensuring that the risk-to-benefit ratio suggested by the evidence is acceptable and accurate. History highlights the perils of rushing vaccine production. In 1955, errors made in the production of the polio vaccine by Cutter Laboratories gave rise to more than 100 cases of paralysis as well as to 10 deaths.[5] More recent incidents involving the dengue vaccine in the Philippines underscore the same lessons. The eagerness to benefit the populace should not obscure an arguably stronger ethical obligation to avoid inflicting harm on healthy individuals.[6]

As the development of a COVID-19 vaccine looms, the need to determine how to fairly allocate this scarce supply is imperative. The ethical dilemmas involved are further exacerbated by the fact that the distribution of the eventual vaccine will inevitably transpire on a global scale. The imbalanced and opaque sequence that characterized the early distribution of the limited supplies of the drug remdesivir should serve as a cautionary tale. The same mistakes must not be repeated.[7] Only transparent and consistently applied allocation procedures will ensure public trust, especially in the case of vaccines. Ensuring that the allocation of vaccines is effective, fair, and justifiable to all is a priority that must not be compromised.

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