Pluralism and Allocation of Limited Resources: Vaccines and Ventilators

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In the response to this pandemic, two vital, but controversial ethical questions are we should allocate ventilators to patients with severe respiratory failure, and how we should distribute vaccines to people at risk of contracting coronavirus. There are opposing ethical views about how to prioritise, and countries have taken different approaches.

There is a strong ethical argument that policies should take a pluralistic approach to allocation that reflects multiple ethical values - both because of the diversity of viewpoints within communities and the recognition that there are competing relevant ethical values. In this chapter, I look at the epistemic and normative problems raised by pluralistic allocation in this pandemic and suggest implications for future pandemics. I summarise some of the relevant evidence about the public's views and values relating to prioritisation. I also explore some practical approaches to prioritisation of scarce resources in the face of contrasting and competing ethical values.

1. Conflicting values, conflicting choices

1.1. Problems

The defining feature of a pandemic is its scale. An infectious disease that acutely spreads affecting a large number of individuals in multiple different countries across the world will necessarily have a very large human impact. It will also, almost inevitably, lead to intense pressure on a range of medical resources and a need to make difficult decisions about how to allocate them.

Depending on the specific country, and depending on the time point, different resources have been in short supply during the coronavirus pandemic. These have ranged from personal protective equipment to novel therapeutic agents, oxygen to continuous positive pressure devices, ambulances, care staff, medical appointments, hospital beds, petrol and even toilet paper. For this chapter I will focus on two key resources that have been scarce and needed to be prioritised during the pandemic: ventilators and vaccines. While these specific resources may or may not be relevant in future pandemics, they are useful to examine. First, these are life-saving resources – decisions about how we allocate them in a pandemic could affect not only who lives or dies, but how many. Second, both are examples of perennially scarce medical resources. Investment might reduce

the problem of demand exceeding supply, but it cannot avoid the problem. Even in high income countries in non-pandemic times there are challenges in making ventilators available to all patients who might benefit from them. They are expensive to purchase and maintain, but even more importantly, such equipment requires highly specialised trained medical and nursing staff. Novel vaccines take time to develop and then to produce in bulk. Notwithstanding the unprecedented pace of development and distribution of a vaccine against COVID-19, there have been inevitable delays in scaling up production once they had been shown to be effective and safe. Third, these two resources epitomise two different types of medical response to a pandemic. Vaccines are a preventative intervention. They are relatively low cost, but are given to a very very large number of people. For example, the whole global population might benefit from vaccination if Disease X were to pose a serious threat to all (regardless of age and underlying medical condition). Ventilators are a life-saving supportive intervention. They are relevant to a smaller number of individuals but are resource intensive in terms of money, equipment, supplies, companion treatments (eg sedation/anaesthetic agents) and especially staff. As I note in section 4, because of the different nature of these two interventions – they have different ethical implications for allocation.

1.2. Choices

One striking feature of the coronavirus pandemic has been the variation between countries in their approaches to a range of different questions. That has perhaps been most evident in the approach to lockdowns and restrictions of liberty,(Cameron et al. 2021) but it has also been seen in very different approaches to allocation of ventilators and vaccines.

There are multiple factors that have affected countries' choice of resource allocation policy – including the different circumstances of the country (eg the prior resources of the country, the severity of the pandemic wave), different scientific advice (or interpretations thereof), and different legal or political frameworks. However, one key factor reflects the weight given to different ethical values that are relevant to allocation.

While there are multiple values that might be drawn on,(Giubilini et al. 2021) broadly speaking there are several key ethical values that are crucial to allocation of scarce medical resources.(Emanuel et al. 2020) The first of these is the value of promoting wellbeing through medical benefit (in particular prevention of death, avoidance or relief of medical illness or morbidity). The second value is that of treating people equally (or equitably). A third (overlapping) value relates to treating those who are most disadvantaged or worst off. A fourth commonly cited value is that of caring for those providing health-care. (This could be ethically justified in straightforward utilitarian terms – ie because of their instrumental importance in achieving the greatest benefit overall. Or, it could be justified as a form of recompense for risks undertaken in the service of others). Depending on their ethical and legal framework, a country might prioritise one of these values over the other. For example, a utilitarian approach would pursue which ever policy would maximise utility (wellbeing).(Savulescu et al. 2020a) An egalitarian policy would potentially focus on equality of access to treatment. A prioritarian approach would prioritise those who are worst off. One challenging element of resource allocation is that these ethical values necessarily conflict in a setting of scarcity. It is usually not possible to promote greatest medical benefit, greatest equality, and attention to greatest need/disadvantage simultaneously. Decisions must be made.

Some of the different policy choices seen in relation to ventilator and vaccine allocation appear to reflect different weights given to these ethical values. For example, guidelines from the French anaesthesia and intensive care society explicitly endorsed that the aim of ventilator allocation should be to maximise numbers of deaths avoided and the number of life years saved (Société Française d'Anesthésie-Réanimation 2020).[1] In contrast, Belgian guidelines concentrated on medical urgency, and contemplated a lottery for deciding between patients with similar urgency (Jöbges et al. 2020).[2] Some US triage guidelines recommended that triage officers be

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1 "[The principal challenge is to minimise the number of deaths and secondarily to maximise the total number of years of life saved. Each decision must thus aim to maximise the chance of survival – not only of each individual patient, but also and especially of the greatest total number of patients.]" page 3

blinded to all patient factors other than acute illness severity and intubation status, while others prohibited consideration of disability or age in allocation, giving more apparent weight to equality (Antommaria et al. 2020). For vaccines, the UK approach concentrated primarily on the risk of severe COVID-19 – giving priority first to residents (and workers) of care homes for older adults, then other frontline health care workers and older adults in descending order of age (with some listed medical conditions giving extra priority). This was based on a desire in the first phase to protect those at highest risk of dying from COVID-19 (in the second phase, it was based on prevention of hospitalisation) (COVID-19 green book 2021). Other countries had a less stratified approach. For example, in February 2021, in San Luis Obispo county in California, all those eligible for the vaccine over the age of 65 were able to register online and were put in a lottery to receive a vaccine appointment (Health Agency 2021). In India, free of cost vaccines were made available to health care workers and all those over the age of 45, with younger patients a lower priority (National Expert Group on Vaccine Administration for COVID-19 2021). A different approach was taken by Indonesia, which elected (at least in the initial phase) to prioritise vaccination for younger adults (aged 19-59) ahead of the elderly (Fuady et al. 2021).

1.3. Public values

Different countries may place greater or lesser weight on competing ethical values because members of those communities or the politicians representing them see those values as more or less important. There is some interesting evidence relating to shared and diverging views between countries relating to vaccine allocation. A large international survey and conjoint analysis of competing factors in allocation, involving more than 15,000 respondents in 13 countries found that health care and those with "high risk of COVID-19 death" were more likely to be allocated vaccine in all 13 countries (Duch et al. 2021). However, while there was evidence of significant apparent consensus, there were some differences. Respondents from China were less likely to allocate the vaccine to older recipients. (The authors speculated that this may have reflected a concern about giving a new vaccine to older individuals. However, it might also have reflected a greater ethical weight placed on saving the lives of those who are younger.) Those who identified as having a left/centre political ideology were less likely to allocate the vaccine to recipients in the highest income bracket (compared with those identifying with a right of centre political ideology). In another study, over 80% of a US representative sample indicated strong support for allocating vaccines to those with the highest risk of severe illness (Gollust et al. 2020). A US Gallup/COVID Collaborative survey found that 74-85% respondents supported giving priority for vaccine access to Black, Hispanic and Native Americans (Persad et al. 2020). We surveyed more than 2500 members of the general public in the US and UK, and found very similar apparent ethical values between the countries.[3] Most respondents allocated scarce vaccines in a way that would avoid the most cases of severe illness from COVID (ie consistently prioritising those who were at higher risk of severe COVID). In that survey we specifically explored how much weight respondents gave to perceived social injustice and race compared with risk of severe COVID. In scenarios involving recipients otherwise equivalent in risk, respondents were more likely to allocate a vaccine to a patient from a racial minority. However, race was not given more weight in resource allocation than other risk factors such as sex and obesity. Significantly, respondents did not prioritise race over risk of severe COVID.

There is also some evidence about public views on allocation of ventilators in the pandemic. In a survey of the UK public, we found that a majority prioritised patients who would have a higher chance of survival, longer life expectancy, required shorter duration of treatment, were younger or were less frail. Where there was a small difference between two patients, a larger proportion elected to toss a coin to decide which patient to treat. (Wilkinson et al. 2020) Our survey findings were somewhat different from another general public survey conducted during the COVID-19 pandemic. Buckwalter and Peterson conducted an online survey with US

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2 The idea of using first-come-first served or a lottery was removed in a later version of the Belgian guidance. (Ehni et al. 2021)

3 Kappes A, Zohny H, Savulescu J, Singh I, Sinnott-Armstrong W, Wilkinson D. Public attitudes towards race and resource allocation in a pandemic. (under review)

respondents. Participants indicated support for triage policies that aimed to save the most lives ('utilitarian' policy) or treat the sickest patients (labelled 'prioritising the worst off'), but disagreed with policies that treated patients in order of arrival ('egalitarian') or prioritised based on social importance.(Buckwalter and Peterson 2020) They also appeared to support policies that would mitigate disadvantage for people of colour. A German study (prior to the pandemic did not find support for age as a criterion relevant to prioritising healthcare, (Diederich et al. 2011) while a US study during the pandemic found that respondents allocated more ventilators to younger patients.(Huseynov et al. 2020) Similar to our findings in relation to vaccines, in our survey examining the relevance of perceived social injustice on allocation, US and UK respondents did not give additional priority to patients from a racial minority.[3]

2. Pluralism in pandemics

In determining how we respond to a pandemic threat like coronavirus or the future Disease X, one 'monistic' philosophical response to the diversity of opinions is to attempt to determine which view is correct and to apply that to policy. For example, we could try to defend and apply a consistently Utilitarian approach to allocation. (Savulescu et al. 2020a) In contrast, philosophical *pluralism* endorses or accepts that there may be a range of different answers without it being always possible to decide between them. There are different forms of pluralism. For the purposes of this discussion I will draw on two: value pluralism and political pluralism. (Galston 1999) The former is the view that there is more than one moral value at stake in decisions. The latter refers to the idea that within any society there will be a diversity of value systems, and a diversity of views about how to live. As a consequence, negotiation, tolerance and compromise are necessary.

It is beyond the scope of this chapter to give a detailed history or exposition of political pluralism, but it is worth briefly outlining its relevance for debates about medical treatment.

The starting point is an empirical observation – within contemporary societies we encounter diversity. John Rawls, in his book 'Political Liberalism', noted that democracies are "always marked by a diversity of opposing and irreconcilable religious, philosophical and moral doctrines".(Rawls 1993) Rawls saw such diversity as arising from incompatible beliefs about the ultimate purpose and meaning of human life, but also from the limits of the human capacity to reason and evaluate. How should we respond to such diversity? Rawls, Berlin and others have suggested that the most appropriate response is a liberal one – that as far as possible we should allow people to live their lives according to their own values. In particular, we should avoid imposing the values of the majority on all. However, in thinking about allocation of resources a simple liberal approach is not sufficient. In such situations, where it is necessary to decide on a uniform law or policy, compromise may be needed, but this should respect and tolerate a range of different viewpoints where possible.

Political pluralism can be based on value pluralism. If there are multiple incommensurable values at stake, it is understandable if different individuals weigh these differently in their lives, and reach different conclusions for example about when medical treatment should cease. Yet political pluralism can be based more simply on humility in the face of moral uncertainty. We cannot be sure that our view is the correct one and should take into account the possibility that others are right. However, it is important to note that pluralism is distinct from relativism (Berlin 1998). Allocation policies do not need to take into account all values that might be espoused, nor do they necessarily need to give equal weight to different values.

Prior to the coronavirus pandemic, and during it, various authors have sought to develop approaches that incorporate more than one ethical value. For example, in an influential paper, published in the Lancet in 2009, Persad, Wertheimer, and Emmanuel evaluated 8 allocation principles. These reflected the three ethical values summarised above (and also considered social usefulness). They reviewed some existing approaches, including the UNOS points system used for organ allocation, and ultimately recommended a different multi-principle allocation system (Persad et al. 2009). Early in the COVID-19 pandemic, Emanuel along with other colleagues

drew on the same underlying value pluralism to propose some pragmatic recommendations for allocation of treatment in the impending crisis. They recommended for example that:

1. Maximising benefits (both saving lives and maximising life years) should be most important,
2. Front-line health care workers (and others vital to keep critical infrastructure running) should receive priority
3. Random allocation (but not first-come,first-served) could be used to allocate between those with similar prognosis.(Emanuel et al. 2020)

A somewhat similar multi-principle approach was incorporated into guidance developed by White and colleagues at the University of Pittsburgh and applied in various US states, including Pennsylvania and Minnesota.(White and Lo 2020) That approach recommended prioritising first based on short term prognosis (chance of survival – based on acute severity of illness), while also giving lower priority to patients likely to die within the near term (<5 years) even if they recovered from COVID. It also considered giving additional priority to those vital to the public health response, and (as a tie-breaker) patients from younger age groups.

As noted in section 1, many countries' vaccine allocation schemes have included both priority for those at higher risk of COVID, and priority for healthcare workers/care home workers. This might plausibly reflect giving ethical weight both to securing greatest medical benefit and to social instrumental value (ie health care workers are prioritised in order to enable ongoing medical care provision (and reduce nosocomial spread). But some have argued that vaccine priority in a crisis should be given preferentially to groups who have been structurally and historically disadvantaged even if it would result in fewer lives being saved. (Schmidt 2020) Schmidt argued in favour of a weighted lottery incorporating the Area deprivation index to give residents of historically disadvantaged neighbourhoods a higher chance of receiving a vaccine. Others have also endorsed a weighted lottery as a way of balancing competing ethical values for allocation of vaccines and other scarce medication. (Jansen and Wall 2021)

I have focused for this chapter on vaccine allocation within countries, but some similar issues have arisen when allocating vaccines between countries. The international COVAX initiative aimed to equitably allocate vaccines between countries on an "equal proportional share" principle wherein in the first phase each participating country receives enough doses to vaccinate 20% of their population. However, this appears to give a great deal of weight to equality at the cost of health benefit. In another paper, Emmanuel pointed out that this plan would give equal number of doses to Malaysia and Peru, though Peru had experienced by early 2021 7 times more cases and more than 60 times as many deaths as Malaysia (Emanuel et al. 2021). Emmanuel proposed a modified allocation scheme that would give countries in greater need (ie at highest risk of premature deaths) more vaccine doses initially.

3. Challenges to developing pluralistic resource allocation in a pandemic

Faced with Disease X, there are good reasons to adopt a pluralist approach to resource allocation. There are clearly more than one ethical value that have been identified as relevant to these decisions. Moreover, within the community there are different views about how to balance these values. I have noted some significant overlap in views based on empirical studies of the views of the public during the pandemic (I will return to the significance of this in the section 4.2). However, there also appear to be some key areas of disagreement. That particularly applies to the incorporation of certain characteristics such as age or disability into decisions. Our survey relating to ventilator allocation found that the majority of respondents chose to allocate the last remaining ventilator to a younger patient rather than to someone elderly (other factors were equal). However, approximately 20% elected to toss a coin to decide between patients 15 years apart in age.(Wilkinson et al. 2020) This was more marked in relation to pre-existing disability, where in several scenarios approximately 40% of respondents elected to toss a

coin to decide between patients one of whom had a greater degree of physical or cognitive disability. In the UK, early in the pandemic, national guidance that recommended clinicians take into account the degree of patient frailty when deciding about admission to intensive care was subject to legal challenge on the basis that it discriminated against those with underlying disability (Hodge Jones and Allen 2020).[4]

There are several challenges to a pluralistic approach that have been particularly apparent in the coronavirus pandemic. It will be important to consider these for Disease X.

3.1. Epistemic challenges

One difficulty in thinking about an approach that takes into account different ethical values is to know how much weight to give to them. The multi-principle allocation schemes proposed by Emmanuel and White both give greatest weight to maximising benefit, while others have criticised this emphasis, citing concerns about equality or fairness. (Kerr and Schmidt 2021; Supady et al. 2021) Although surveys cannot (on their own) resolve ethical questions, one potential way of helping to determine how much weight to give to a particular value would be to evaluate the views of the wider community. That could help to identify areas of common ground as well as ethical diversity. In a democracy, such a process could provide a legitimate basis for giving greater weight to those ethical values that are most widely or most deeply supported by the community.

Some work on this had occurred prior to the coronavirus pandemic. For example, the University of Pittsburgh framework was influenced by public engagement work including community engagement forums focussed on pandemic resource allocation that had taken place in the state of Maryland in the preceding two decades. (Biddison et al. 2018; Daugherty Biddison et al. 2014; Daugherty Biddison et al. 2019) When the Maryland forums were replicated in Texas, a greater emphasis was placed on the significance of family.(Schoch-Spana et al. 2020) This suggests that it may be inappropriate to extrapolate from the values obtained in other countries, or even in other regions within a country. Furthermore, it should be questioned whether the views of the community obtained in relation to a hypothetical future pandemic would necessarily correspond to those at the time of a crisis. Some have speculated that the brutal reality of a pandemic would lead to greater emphasis on achieving the most benefit overall from scarce resources,(Savulescu et al. 2020a) while others hypothesised that community fears might lead to greater concern for individual rights.(Antoniou et al. 2021)

The lack of relevant information about the values of the community prompted a number of researchers to perform community surveys during the coronavirus pandemic. Those studies provide some valuable insights as noted in section 1.3. However, they also highlight serious limitations. Firstly, such surveys took considerable time to set-up, perform, analyse and publish. Two of the earliest of the COVID pandemic studies on ventilator allocation (Buckwalter and Peterson 2020) (Wilkinson et al. 2020) were published as pre-prints in late June and early October 2020, and in a journal in November and December the same year. However, this meant that contemporaneous data was too late to be of any value for the first wave of the pandemic (March-May) when many health systems were most concerned about the risk of intensive care capacity being overwhelmed, and were actively attempting to generate policies and guidance. Secondly, the sort of data that was obtained during the pandemic was quite different from that obtained in the Maryland deliberative democratic forums. Those forums had comprised a series of full-day in-person meetings. However, the studies occurring during the pandemic had largely involved relatively short online surveys. Such methods allow quantitative data from large groups that are somewhat representative of the wider community. However, they potentially yield only immediate intuitive responses to short focused questions or scenarios. The insights gained might be thought to be superficial or highly context specific. It is often difficult to know why certain views were held, what the participants' understanding was and whether their answers represent considered reflection. A small deliberative study, undertaken in the UK at a similar time to the previously mentioned online surveys (but published in

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4 Ironically, one of the responses to this criticism was to recommend that the clinical frailty scale not be used for patients under the age of 65. In doing so, the policy became explicitly ageist.(Wilkinson 2020)

March 2021), found some endorsement of a utilitarian approach to triage (maximising chance of survival), but tempered with equality and priority (vulnerability) concerns (Kuylen et al. 2021). Framing of problems may be influential. For example, when US participants were asked about policy choices they appeared to give significant weight to social justice (as well as utility). Researchers found less support for triage allocation approaches focused on saving most lives, if that would disadvantage people of colour. (Buckwalter and Peterson 2020) In contrast, our study from US residents, indicated that given specific dilemmas of having to choose to allocate a single remaining ventilator, respondents overwhelmingly chose to direct treatment solely based on which patient had the higher chance of survival (regardless of race).[3] Finally, those members of the community most likely to be adversely affected by pandemic are often under-represented in surveys relating to the views of the public about triage.(Kerr and Schmidt 2021) That may be even more likely to be the case during a crisis.

3.2. Normative challenges

If we have reliable, applicable data on the values of the community, there remains a challenge in knowing how to use that in developing pluralistic policy.

Identifying values that are held by the majority of the community provides support for incorporating those into resource allocation approaches. Yet, as already noted, such empirical evidence does not resolve ethical questions. There may be some values that are held by a majority in the community that should not be included in allocation because views are based on ignorance, forgetfulness, inattention, bias or the influence of powerful emotions (Sinnott-Armstrong and Skorburg 2021). On the other hand, if we are political pluralists, the fact that a particular ethical value is supported by only a minority of the community does not mean that it can necessarily be ignored. As long as it has some reasonable basis, we should attempt to respect it and reflect it in policy if we can.

Furthermore, there is a particular challenge in knowing how much weight to give to different values and then in how to translate that into specific decisions. Providing a ventilator or a vaccine is necessarily a binary decision (patients cannot have only part of a ventilator). Individual patients or patient groups may have some ethical factors favouring allocation (better prognosis, more life years), and others not in their favour (prior socio-demographic advantage, not front-line worker). Should some ethical values be given lexical priority, and if so which? Can some values be traded against others, and if so, how?

3.3. Political challenges

Many countries had undertaken preparations for a possible pandemic including developing approaches to the allocation of ventilators or vaccines. And yet, at the start of the coronavirus pandemic there seemed to be, in many parts of the world, a sense of being caught out. There was considerable political sensitivity about endorsing triage policies, even where these had been prepared. Some professional guidance, developed early in the crisis was rapidly withdrawn in response to criticism, or perceived criticism. For example, the Italian Society of Anesthesiology, Analgesia, Resuscitation and Intensive care produced guidelines in March 2020, after the relatively well-resourced intensive care facilities in Northern Italy were overwhelmed by the early first wave of COVID. (Craxì et al. 2020; Vergano et al. 2020) The guideline noted that age, comorbidities and functional status should be evaluated as part of a decision about admitting to intensive care, and noted that an age limit might need to be considered if there were severe shortages.(Vergano et al. 2020) It was greeted with an outcry in Italy and it was accused of being ageist, discriminatory and unconstitutional. (Craxì et al. 2020) Draft clinical guidance was developed in the UK in late March 2020; it was designed to provide a practical consistent approach to decision-making in the event of hospitals reaching capacity. Yet, the guidance was never published, ostensibly because of a lack of need; many, suspected that this reflected a political unwillingness to be associated with an explicit rationing policy.(Orfali 2021; Wilkinson 2020)

Kristina Orfali, comparing the response to the pandemic of the United States to countries in Europe noted a striking lack of willingness in European countries with large publicly funded health care systems to openly support rationing policies in the pandemic. "[F]ew countries will acknowledge that any triage has taken place for fear of being held responsible for the lack of health care resources or for the failures to provide an efficient response to the crisis."(Orfali 2021) It appeared in retrospect clear that de facto rationing had occurred in both France and the UK (particularly in relation to transfer to hospital), however, there was no official policy, and politicians and officials denied that this had occurred.

4. Disease X

This book is focused on identifying how the experience of the COVID pandemic could help to improve the ethical response to future pandemics. In terms of a pluralistic ethical response to allocating scarce resources like ventilators and vaccines, there are several key lessons.

4.1. Preparation

For ethical guidance to be pluralistic, it needs to reflect the (multiple) values of those in the community. However, the epistemic, normative and political challenges in creating such guidance mean that attempting to do so when the crisis has arrived may be impossible. Orfali speculated that the lack of prior engagement with the community in Europe impeded pandemic preparation, compared with the extensive public discussions that had occurred in the US.(Orfali 2021) It also meant that public debate about the issues during the pandemic was limited, and as a consequence public trust threatened.

Some of the research performed during this pandemic in relation to public values may be helpful for future pandemic planning – even though it was not able to inform the response this time. But there will be a need to build on that body of work to ensure that the picture gained is sufficiently fine grained to be reliable. Some of the technological developments and expertise arising during the pandemic might be able to facilitate community engagement. For example, the use of online public engagement might broaden the group of individuals able to participate. This could address concerns about underrepresentation of disadvantaged groups.

I mentioned one concern, that values obtained prior to a pandemic might be different from those obtained during the crisis (or might even shift over time during a prolonged crisis). Some of the evidence about public values obtained during the coronavirus pandemic is relatively reassuring on this front. One study gave a group of approximately 130 older adults in the US in 2014 and a second group in early 2020 a set of hypothetical moral dilemmas.(Antoniou et al. 2021) The researchers found no difference in their overall utilitarian responses. However, they did find that compared with the earlier group the cohort recruited during the pandemic gave a slightly smaller number of utilitarian responses in dilemmas involving a clash between personal rights and overall benefit[5]. Our own study of ethical response to ventilator triage during the pandemic yielded very similar responses to a prior survey (which had focused on a related set of choices in relation to newborns).(Arora et al. 2016; Wilkinson et al. 2020) We also found very similar patterns of response (strong endorsement of prioritising ventilators to those at highest risk of surviving), among UK respondents completing a survey in June 2020 and those completing a second survey in December 2020.[3]

Preparation may also help to address political concerns about the acceptability of triage frameworks. That can be by identifying broad community support for a particular approach to allocation of resources like ventilators or vaccines (for example, as summarised in section 1.3). It may also be less acutely sensitive. Development and approval in advance of a hypothetical allocation framework may be able to be endorsed by politicians because it will be implemented at some future time point (and thus is less politically risky). There is also the possibility that

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5 Respondents gave utilitarian answers in approximately 6 out of 8 scenarios in 2014, 5 out of 8 in 2020.

later use of a pre-approved framework could be also less politically sensitive since any faults can be attributed to predecessors!

4.2. Ethical convergence

Pandemic preparation doesn't necessarily make any easier the normative challenge of reconciling or balancing conflicting ethical values. However, one possibility is that analysis and debate may identify areas of ethical convergence, where it is possible to identify key elements for allocation frameworks.

One way of thinking about ethical values (or reasons) in a pluralistic approach is that each identified value represents a vector (Savulescu and Protopapadakis 2019). These values have a direction and a strength. Where the vectors all pull in different directions simultaneously, we may find ourselves at a standstill. However, sometimes on reflection it becomes clear that some of the vectors are stronger than others. In other situations, we find that several different vectors pull in the same direction. Then, it becomes clear that notwithstanding our commitment to pluralism, there is most reason to take one approach over another. (Figure 1)

One example of ethical convergence might be the principle of saving the most lives. When we are allocating scarce medical resources there are two different types of choice. One sort of choice involves saving more or fewer lives. This is a *different number* choice.(Wilkinson and Savulescu 2018) For example, a much discussed philosophical thought experiment involves choosing to send a lifeboat in one direction to save 5 people at risk of drowning, or in the other direction to save a single person.(Arora et al. 2016; Taurek 1977) At first glance, this dilemma appears to be a choice between a utilitarian or egalitarian approach. Value pluralism might mean that we could make either choice. However, further analysis yields the conclusion that both egalitarians and utilitarians should support a policy that would send the boat to save the five.(Arora et al. 2016; Wilkinson and Savulescu 2018) This would give equal weight to the value of each life.(Broome 1994) It would be fair to save the greater number (and of course this would also maximise benefit). Indeed, on the assumption that two patients who will die without treatment are equally badly off, a prioritarian approach could also support this allocation. This conclusion is obviously significant for our approach to allocation of vaccines or ventilators. For vaccines, it would lead to prioritisation of those at highest risk of serious illness. For ventilators, it would support prioritisation on the basis of probability of survival and expected duration of treatment. Prioritisation of patients expected to require a shorter duration of treatment would mean that more patients could be treated on ventilators in intensive care. The use of time-limited trials of treatment (with subsequent withdrawal) would facilitate treatment where there is uncertainty about duration of treatment. (Patients who are unwilling to agree to a time-limited trial would have a lower priority for treatment).

The other sort of allocation choice could be called a *same number* choice. It involves choosing between groups of patients, or individual patients where there are equivalent numbers who would be saved, but they differ in some relevant characteristic. For example, choosing to allocate a vaccine to patient with or without prior disadvantage, of older or younger age, expected to live for a longer or shorter time, or with a higher or lower quality of life – would be a same number choice. In such decisions, values of equality or priority would potentially lead in opposite directions from securing greatest benefit, and there is a need to choose between values.

However, it is worth highlighting that the conflict between values may be more or less troublesome depending on the specific decision. Here, there is a significant difference between allocation of ventilators and allocation of vaccines.[6] For ventilators, if there is a choice between two patients, one of whom is older, has prior disadvantage, perhaps has more co-morbidities and is more frail, prioritarianism might direct treatment to the more unwell older patient, while a utilitarian approach would often prioritise the younger patient since they are more likely to survive, but also likely to survive for longer, and perhaps with higher quality of life. (The value of equality might

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[6] This supports the recommendation by Emanuel et al that approaches to prioritisation should vary by intervention (Emanuel et al. 2020).

suggest that each patient should have equal chance of receiving the treatment.) In contrast, for allocating *preventative interventions* like vaccines, giving priority to older, sicker, more frail patients would give priority to the most vulnerable, but also potentially save the most lives/life years. Models suggest that vaccine allocation would yield greatest number of quality adjusted life years (ie greatest overall benefit)s from allocating based on descending age and medical vulnerability.(Moore et al. 2021) In that case, we would get the same answer from both prioritarian and utilitarian approaches (Figure 1).

4.3. Collective reflective equilibrium

Where values do diverge, information about the views of the public could be used to support the development of policy approaches. For example, Julian Savulescu has described and applied a process that he refers to as Collective Reflective Equilibrium in Practice. (Savulescu et al. 2021) This builds on a Rawlsian decision procedure and seeks coherence between considered moral judgements, moral principles and values and relevant background theories. The idea is that data on public intuitions is scrutinised and screened for bias, reliability, understanding and generalisability. It is then used, not to resolve theoretical disagreement (ie whether utilitarians, egalitarians or prioritarians are correct in their view about allocation of resources), rather to identify a legitimate, ethically justified policy.(Savulescu et al. 2021)

Using such a process, the evidence on the views of the public summarised in section 1.3 could be combined with theoretical analysis and considered judgment to yield policies on vaccine and ventilator allocation. For example, it appears clear that there is very strong public support for allocating vaccines preferentially to those at highest risk and to health workers.(Duch et al. 2021; Persad et al. 2020) That would align with key ethical values and the arguments summarised above that for this sort of intervention there is ethical convergence. However, there appears to be somewhat less support for allocating vaccines preferentially to those from disadvantaged sociodemographic groups. The large international survey suggests relative priority to those in the lowest income groups.(Duch et al. 2021) This might plausibly reflect awareness that during the pandemic such individuals have often been at higher risk of exposure to the virus because of types of dwelling and work, and least able to self-isolate. A US survey, similarly, found support for giving priority to those in racial/ethnic communities who had been disproportionately affected during the pandemic.(Persad et al. 2020) However, neither evaluated how this should be weighed against other considerations. In our study of US/UK attitudes to inclusion of race in prioritisation, there was very little support for prioritisation ahead of others at higher (medical) risk of severe COVID.[3] This would support a policy using this factor as a 'tie-breaker' consideration. It might be that within age bands, those from disadvantaged backgrounds have priority access. Alternatively, there might be special efforts to make available the vaccine to members of such communities when they become eligible to receive the vaccine. (Whether this would be successful is a separate question. Perhaps paradoxically, vaccine uptake has often been lowest in some socio-demographic subgroups within the community at higher risk of severe illness from COVID).

For ventilators, surveys appear to show strong support for prioritisation of those individuals most likely to survive (as well as those likely to receive treatment for a shorter period of time).(Wilkinson et al. 2020) As noted in section 4.2, this would line up with ethical convergence in allocating treatment in order to save the most lives. The more challenging choices relate to same-number type decisions, including factors such as patient age, or quality of life into triage. One factor, that has been incorporated into a number of triage guidelines in the coronavirus pandemic is that of patient frailty.(Wilkinson 2020) This is an ethically complex factor to include in triage since it simultaneously is associated with several different elements of prognosis that might (or might not) be relevant to allocation. For example, more frail patients who need intensive care are less likely to survive, but also likely to survive for a shorter period of time, with reduced quality of life. However, that might be an advantage from the point of view of ethical convergence. Few studies have evaluated the public's attitudes towards including frailty in intensive care triage, and that may merit further, more detailed evaluation. In one study that has evaluated this, members of the UK general public strongly supported prioritisation of less frail
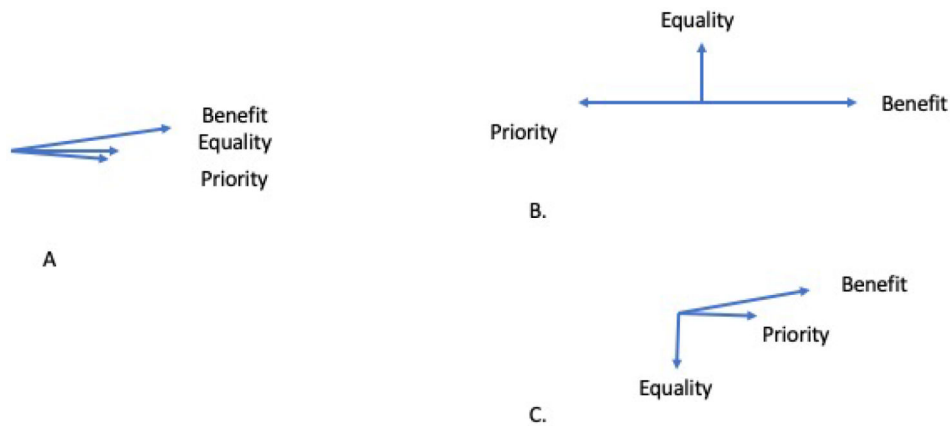
Figure 1. Ethical vectors: Values have directions and strength A. Different number choices (key values converge) B. Same number choices (values diverge) eg ventilators C. Same number choices – vaccines (values converge)

patients in the setting of pandemic triage and critically scarce resources.(Wilkinson et al. 2020) (A small deliberative study also found support for this (Kuylen et al. 2021).)

4.4. Dissensus and Parity

Convergence and consensus may be possible. But it will not resolve all dilemmas. What should we do then?

One way of balancing two of the ethical values in allocation (benefit and equality) would be to draw on the concept of parity.(Wilkinson and Savulescu 2018) This is the idea that patients who differ to some degree in a characteristic relevant to allocation may nevertheless be treated similarly. For example, if one of two patients has a slightly higher predicted chance of survival, it might be warranted to nevertheless give them both equal chances of receiving treatment. This would reflect consideration of inevitable uncertainties in prognostication. However, it would also give some weight to the value of equality. The greater our degree of uncertainty in predicting outcome, and/or the greater the weight that we give to equality, the broader the group of patients who will be treated as equivalent for allocation. When we asked members of the general public their views on ventilator triage dilemmas, they elected to toss a coin to decide only when patients were very similar in their estimated chance of survival. However, in other (same number) scenarios – where patients differed in degree of disability or in age, there was more apparent willingness to give patients equal chances. This suggests that we could potentially include some more controversial characteristics for ventilator allocation (for example age and disability). This might, for example, mean that advanced age or severe disability could be incorporated into triage where resources are limited, but lesser degrees of age or disability would not be (even if they were associated with prognosis). That would give some weight to the value of equality, but be balanced against benefit.

Where there is clear divergence in the values endorsed by different members of the community or between the community and the results of ethical analysis, it may not be clear how to reconcile these. There may be more than one ethically justified legitimate policy option and different communities may reach different conclusions. (Savulescu et al. 2020b) Perhaps we should accept the inevitability of ethical dissensus.(Wilkinson et al. 2016) Ultimately, that may itself be useful, since it could represent a form of natural experiment and make it possible (afterwards) to review the impact and acceptability of different approaches taken. (To some degree, this book represents just such an endeavour to evaluate the strategies adopted for the COVID pandemic).

4.5. AI ethics

Finally, and more speculatively, it is possible that lessons from the COVID pandemic might lead us to a more radically different allocation approach for disease X.

Machine learning and artificial intelligence is being actively explored for a wide range of different applications where the limits of human capacities significantly constrain our ability to make important decisions. That applies to various important areas of science relevant to disease X (for example, forecasting infection dynamics, early detection of flu-like illness, monitoring of response to existing and novel treatments).(Syrowatka et al. 2021) However, it also applies to some of the ethical elements of resource allocation.(Sinnott-Armstrong and Skorburg 2021)

AI could play an important role in identifying and assessing the values of the community as they relate to allocation of resources. It might thus help with some of the epistemic problem of identifying and weighing the values that are relevant to pluralistic allocation. It might help in modelling and evaluating different allocation frameworks. And it could be used to provide a sophisticated way of yielding decisions about allocation of scarce treatments that could incorporate both different patients factors and ethical values. For example, some authors have proposed the use of weighted lotteries to allocate scarce novel therapeutic agents in the setting of the COVID pandemic.(White and Angus 2020) Such lotteries are designed to allow centralised, consistent, procedurally fair allocation that incorporates strong commitment to equality alongside some adjustment to priority for benefit (or disadvantage). However, it would be possible for AI based allocation to use more sophisticated models that would incorporate a range of patient factors as well as different ethical values, identifying when priority should be given, when some form of randomisation might be justified (for example, when patients fall into a 'parity' group), and when treatment should not be allocated.

The use of AI in allocation raises other issues, beyond the scope of this chapter. AI based allocation may be perceived as lacking ethical transparency (Durán and Jongsma 2021), or subject to bias in the data or assumptions incorporated into programming. (Though such concerns potentially apply even more strongly to conventional 'human' resource allocation). There is important empirical work to be done to assess the acceptability of such an approach particularly given that in the past, the public has been strongly sceptical about the use of lotteries for allocation. (Grover et al. 2020; Krütli et al. 2016; Schoch-Spana et al. 2020)

5. Conclusions

Balancing competing ethical values in a pluralistic approach to allocation is difficult. However, realistically there is no alternative, and this will be essential for our response to future pandemics. I have outlined some of the practical and normative challenges evident from the coronavirus pandemic in vaccine and ventilator allocation. I have also identified some potential learning points. There appear to be significant areas of agreement within and between countries about which values might be given most weight in allocation. There are also some important points of ethical convergence. Through a process of practical collective reflective equilibrium we may be able to develop in advance pandemic allocation plans that could be adopted or adapted for Disease X.

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