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Introduction

Dominic Wilkinson and Julian Savulescu

The COVID-19 pandemic has been a defining event of the 21st century. Global estimates of excess mortality indicate that it has taken fifteen million lives over 2020-21 (Knutson et al. 2022). It has closed national borders, put whole populations into quarantine and devastated economies. Almost half of workers in low or middle income countries lost a job or business due to the pandemic (Anonymous 2021). The International Monetary Fund has estimated a global loss to the world economy of US\$12trillion by the end of 2021 (Bill and Melinda Gates Foundation 2020). It led to a rise in rates of extreme poverty for the first time in 25 years, with 37 million additional people experiencing this in 2020. The pandemic toll and the cost of measures taken to combat it—both effective and ineffective—has been paid in human lives, mental and physical suffering, and economic hardship. The costs will continue to be paid by individuals and societies for decades to come. While the COVID-19 pandemic has been catastrophic, it is not unique. It is not as severe as Spanish influenza, estimated to have killed between 50-100 million people. Recent MERS and SARS epidemics were more deadly to those infected, but less contagious. Future influenza pandemics, perhaps like the hypothetical example above, undoubtedly lie ahead. We await ‘Disease X’, the World Health Organisation’s placeholder name for “a serious international epidemic ... caused by a pathogen currently unknown to cause human disease.” In some ways, the COVID-19 pandemic has been a wake up-call. Children who have been home-schooled during the COVID pandemic will almost certainly face another pandemic in their lifetime – one at least as bad—and potentially much worse—than this one.

The first reports of an undiagnosed severe respiratory illness in people working in or attending a street market in South East Asia attracted little international public attention. They caused barely a ripple amid the maelstrom of competing voices in mainstream and social media. The reports were read or shared by few, and the busy global news cycle rapidly moved on. After all, such reports have occurred many times before, and usually do not lead to anything. Comments by local public health officials were reassuring – investigations were underway, but they did not believe that there was any cause for alarm.

But the reports were noted by several international groups tasked with detecting and responding to possible pandemic threats. They were catalogued and classified by an automated early warning system, setting in motion preliminary steps to investigate the cause of the outbreak and assess the potential for

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wider spread. Real-time data from local hospital facilities, including the numbers of cases presenting, their clinical features, severity of illness, and apparent connections to the index cases were openly shared as part of a national and international surveillance network. International experts provided remote support for investigations into the organism causing the outbreak, including rapid genetic sequencing of the virus that had been obtained from some of those who were unwell. At the same time, automated monitoring of local social media accounts flagged the possibility of a wider group of patients with potential prodromal symptoms.

By the time that results confirmed that this was a new variant of H7N9 avian influenza with human to human spread (bird flu), several pre-existing plans had been put in place. Stringent travel restrictions were implemented in the region of Northern Thailand where the cases had been reported. Cross border travel including most flights from regional and national airports were suspended. As previously rehearsed and planned, a snap lockdown was instituted in affected cities along with careful, thorough explanation to the community of the situation and rationale for the response. But there was also immediate release of a package of international financial support to Thailand to support the affected communities and work sectors. Medical and food supplies were released from regional stockpiles. Hospitals in Thailand implemented the first stages of triage plans to care for any affected patients as well as to prioritise access to intensive care. There was limited data initially to help identify which patients might be most likely to survive, but data from the first patients treated indicated that the virus had a high mortality among patients in their early twenties without preexisting illness. These results were fed into a national emergency triage plan that had been developed with input from national and international ethicists, community leaders and the wider public. It was automatically enacted once the severity of the outbreak was recognised. At the same time, early experience was fed into the corresponding (but variable) triage plans that were in place internationally in the event that the outbreak spread further. mRNA vaccine hubs in Bangkok and in Vietnam had already started work on modified vaccines for the new strain of the virus. As part of an international agreement, vaccine trials and early access to the vaccine would prioritise regions with greatest disadvantage and highest rates of circulating virus.

In the event, the 2027 avian influenza epidemic remained largely confined to Northern Thai cities. Variable lockdowns and travel restrictions remained in place for much of the next 12 months, while other cities in the region and elsewhere imposed brief snap lockdowns in response to cases of possible spread (but which fortunately turned out not to be). A generous package of support and investment meant that the Thai economy was not negatively affected overall, while individuals disadvantaged by the infection (or the response) were able to access compensation. The Thai government received high levels of political support nationally and internationally for their rapid proportionate response together with their commitment to transparent communication with the population. When the vaccine became available, priority access for Thailand and a rapid dissemination program meant that the Thai community had high levels of vaccination by mid 2028.

Pandemic experts around the world breathed a sigh of relief. It might have been so different...

The above fictional vision of a coordinated, carefully planned and executed national and international response to a future deadly epidemic might appear frankly utopian, but it is clear from our recent experience that there are good and less good ways that we might respond to such a future threat.

The COVID-19 pandemic has been a defining event of the 21st century. Global estimates of excess mortality indicate that it has taken fifteen million lives over 2020-21 (Knutson et al. 2022). It has closed national borders, put whole populations into quarantine and devastated economies. Almost half of workers in low or middle income countries lost a job or business due to the pandemic (Anonymous 2021). The International Monetary Fund has estimated a global loss to the world economy of US\$12trillion by the end of 2021 (Bill and Melinda

Gates Foundation 2020). It led to a rise in rates of extreme poverty for the first time in 25 years, with 37 million additional people experiencing this in 2020. The pandemic toll and the cost of measures taken to combat it—both effective and ineffective—has been paid in human lives, mental and physical suffering, and economic hardship. The costs will continue to be paid by individuals and societies for decades to come.

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The Central Questions – and mistakes

Responding to current or future pandemics requires action based on unresolved, fundamental, and controversial ethical issues. The defining feature of a pandemic is its scale—the simultaneous threat to millions or even billions of lives. That scale creates and necessitates awful choices since the wellbeing and lives of all cannot be simultaneously protected.

Choices

From allocating limited supplies of ventilators, treatments, vaccines or personal protective equipment to policies of restricting movement and freedom, whose needs should be prioritised when not all can be? What ethical principle or principles should we use to make these decisions? Should society save the greatest number or use some other ethical approach?

Choices and trade-offs need to be made between those at higher risk and lower risk of becoming unwell. In the COVID pandemic, a key question has been about whether, (and if so how much) it is acceptable to sacrifice the wellbeing of younger members of the community (ie children and young adults) for the sake of older, more medically vulnerable members. To frame the same question in the opposite way: how many premature deaths of older members of society would be acceptable to allow younger individuals to go about their normal lives? Future pandemics may have similar characteristics to COVID, or may (like the Spanish flu and the hypothetical Thai epidemic) be worse in the young, which may lead to different decisions.

In the face of extremely high demand, choices need to be made between patients who are already unwell. For example, that has led to questions about triage or prioritisation decisions when there are more patients with severe COVID who need ventilators or admission to intensive care than there is available capacity. But there are also difficult choices between patients with pandemic-related illness and other non-pandemic health needs. And of course, there are choices between resources, energy and attention devoted to healthcare, and other needs in society (for example, education, policing, social welfare, and justice). These raise questions about what matters most, but also about commensurability – how (and whether) to compare different priorities.

There are also difficult questions about how to respond to the needs of people in different countries. That raises important issues of partiality and how much it is justified to prioritise the needs of those who are within one’s own community over the needs of those living elsewhere. Some degree of partiality towards those who are close to us seems important. But the extreme national partiality adopted by some countries in the COVID pandemic is hard to ethically reconcile.

The difficult nature of these choices can lead to several tempting, but ultimately mistaken responses. One such mistake is to attempt to avoid choosing. For example, many countries tried in the COVID pandemic to avoid

having to make difficult triage decisions by rapidly expanding intensive care capacity through purchasing additional equipment, building field hospitals etc. However, this strategy doesn't avoid difficult choices, it just displaces the impact. For example, in the UK, surgery and many forms of medical treatment were suspended in order to redirect resources to treatment of COVID patients. That led to harm to other patients, for example who had delayed diagnosis or treatment for their cancer and massive ballooning of treatment waiting lists. Where additional resources were purchased, that has often required very considerable increases in national debt. That then displaces the harm onto future members of society, who will have to bear those costs in the form of increased taxation, reduced availability of services (or likely both). The mistake here, is not the decisions themselves. They may have been the right ones (though not all agree on this). Rather, the mistake is to pretend that choices do not need to be made. Clearly choices *have* been made – often prioritising visible, immediate needs over the needs of other less visible individuals.

Another avoidance strategy is to conflate questions of relative benefit, with absolute benefit. Where treatments are withheld in the setting of limited resources, it is sometimes claimed that the treatment would not work. On that basis, some elderly patients were not transferred in to hospitals, masks were not recommended (at early stages), or vaccines were said to not be indicated for some groups. It is easier for health professionals or health systems to withhold a treatment on the grounds that it would be ineffective, than to explain that another patient or individual needs the treatment more. But such a communication strategy obscures the value-based choices that underlie decisions and may threaten public trust in public health communication as well as prevent important debate.

A third strategy tries to avoid value judgements or choices by resorting to the fig leaf of scientific evidence. In the COVID pandemic, political leaders claimed to be “following the science”. To be clear, the claim is not that science is not helpful in responding to a pandemic. On the contrary, it is absolutely vital to both gather and appraise scientific evidence to inform decisions. However, that evidence does not make decisions. For one thing, the nature of pandemics is that they always reflect novel infectious agents. (It is the absence of pre-existing immunity that gives them the potential to spread across the world and infect millions within a short space of time). That means that there will always be a lag between the onset of a pandemic and evidence emerging about the best ways to respond to it. Although the COVID pandemic saw a completely unprecedented level of dedicated research effort (with more than 100,000 published articles by the end of 2020) (Else 2020), much evidence emerged only after the initial waves had already passed. Especially in the initial phases of a pandemic (when rapid responses may be vital to minimise the total impact), there will always be significant uncertainty about the impact of different choices. We will need ethics to make decisions in the face of uncertainty. For example, when a new possible threat arises, as in the case example above, policy makers will need to decide whether to take pre-emptive actions (that might prove to be unnecessary), or risk responding to late to prevent wider spread of the pathogen. But importantly, even when there is good scientific evidence available, there is a need for value judgements to make decisions about which strategy to pursue.

Science alone can never tell us what we should do. It can tell us how to achieve a goal, but not what that goal should be. Decisions require not merely evidence but values. The identification and weighing of values is an ethical task. For example, through the pandemic, the public were presented with COVID death counts, or strictly deaths associated with COVID. The goal was to reduce COVID deaths. But that is only one value. It ignores the deaths or impacts on well-being of those who don't have COVID. In the UK, vaccines were rolled out to the oldest first, starting with those 90-100. This places a value equally on all lives, regardless of age. However many people believe that younger lives should have priority over older lives. The outcome of the pandemic could have been in terms of years of life lost, or QALYs lost. China chose to prioritise its working population for vaccination. These all illustrate different values. It is the job of ethics, not science, to adjudicate between competing values.

Freedom

Next, our response to pandemics intersects with some fundamental questions about basic human rights and liberties. That is because infectious diseases spread when humans interact. Our most powerful ways to diminish or stop the spread of infections involve measures that reduce or stop human interactions. This was recognised in the 14th century when ships arriving in European ports were required to remain offshore for a period of forty days (from which derives the English term “quarantine”) to reduce the risk of bringing plague ashore. But of course such measures have the obvious potential to conflict with individuals’ freedom to move, to associate, and to go about their lives as they would otherwise wish to.

The vital question is how much restriction of liberty is justified in order to prevent transmission of infections. This might include those confirmed or suspected to have a pandemic infection. Yet, it may be impossible to identify people carrying the infection in the early phases. (The most successful pandemic agents typically have a prodromal stage in which patients are infectious but unaware of this and thus do not know to modify their behaviour). So potential measures to stop pandemic spread will often include many individuals who do not actually carry the infection, but are at risk of doing so.

One mistaken response to this problem is to assume that the benefits of preventing transmission can be achieved through voluntary measures. For example, some claim that equivalent effects on spread of COVID-19 could be achieved without mask mandates, work-from-home orders, or restrictions on social gathering. But it seems fairly indisputable that voluntary measures, in most circumstances, have a smaller impact on interactions and spread of infections than compulsory ones. In general, during the COVID-19 pandemic, those jurisdictions that imposed the fastest, most stringent restrictions on movement and travel, had the greatest success in curtailing spread of the virus (at least in the early stages). That does not necessarily mean these were the better options. It means that in a pandemic individual liberties have a price. The ethical question is how much of a price we are willing to pay to preserve liberties (or, to put it the other way, how many liberties we are willing to suspend in order to allay a pandemic threat).

Questions of individual liberty versus containing spread of a pandemic arise in a different way once vaccines become available. Then (as discussed in a number of the chapters of this collection), individuals’ freedom to decline a vaccine potentially comes into conflict with the good of controlling the contagion and permitting life to return to normal. During the COVID-19 pandemic, in debate about vaccines, but also in many other issues, a further liberty became highly relevant – freedom of speech. That was because of the large amount of incorrect and misleading information being disseminated about the pandemic, pandemic responses and choices. Such misinformation is enormously damaging to society’s ability to gather and maintain support for appropriate responses to the pandemic. Once again, there are important questions to be asked about how to balance individuals’ right to reach opinions and express their own views, against the greater good. If there is acceptance that in an emergency like a pandemic, some of our usual liberties may be permissibly curtailed, the question then becomes – by how much, and for how long?

Equality

Finally, pandemic ethics brings emerging ethical debates about the structure of society, its inequalities, and our experiences as groups to the foreground:

It is sometimes suggested that death is the great equaliser, since it befalls alike “the righteous and the wicked, ... the good and the bad, ... the clean and the unclean” (Ecclesiastes 9:2). Viruses do not respect national or class boundaries. However, while all are potentially susceptible to a new infectious threat, it does not follow that all are equally susceptible, nor (more importantly) do all have access to equal means to mitigate that threat. It has been abundantly clear that the experience of the COVID-19 pandemic has not been the same for all.

The pressure of the pandemic has pressed on society's weaknesses, turning cracks into fissures. Where inequalities exist, the pandemic has exacerbated them with deeply unequal distribution of both disease harms and lockdown burdens across different groups in society.

Within societies, some groups have been more vulnerable to serious complications of COVID-19 because of pre-existing medical illness or older age. Others (for example health care workers, aged care workers, police officers, teachers) have had high rates of infection related to their work. Still others have been at higher risk of infection or of critical illness and death because of belonging to certain socio-economic and racial groups. The cause of this risk is multifactorial, but it includes factors relating to underlying medical conditions (eg diabetes), type of work, household and living environment (eg living in large multi-generational households). It is also affected by access to health care including measures to prevent transmission and (at least in some places) by systematic or institutional discrimination.

Measures to respond to the pandemic have also fallen unequally. Some have been able to work from home throughout the pandemic. Others have had to continue to leave home to work (often thereby being exposed to the virus), or have lost their jobs. Some children and young people have had access to resources to facilitate online learning. Others (particularly from the most disadvantaged backgrounds) have missed out on essential periods of learning and will never catch up.

Despite the importance of equality, the solution cannot be simply to treat everyone equally. That is because it is impossible in a pandemic to provide the same treatment at the same time to all who might benefit. Second, strictly equal treatment creates unequal outcomes when people differ in their underlying health and health needs. We should potentially focus more on *equity of outcome* than equality of treatment. However, we must also recognise that strict equity is also going to be impossible. Whatever we do, some people are going to become seriously ill while others will have only mild illness; some will live, while other will die. Some children will graduate from school with high marks, others with low. Third, as some of the chapters in this volume discuss, the value of equality/equity is only one of the ethical values that might underpin a pandemic response, and these principles often conflict. As noted above, choices will be inevitable. Fourth, responding in a way that is sensitive to social and other inequalities can be much more complicated and costly than a uniform approach. That will mean that some parts of the world find it easier or much harder to adopt this approach.

Inequality has been even more evident on a global scale. Some countries have fared much better than others. That has arisen partly as a function of geography. For example, some island countries have found it much easier to isolate their population. It has partly related to population differences (for example, in how closely people are living and in the age distribution). It has also arisen as a consequence of domestic political decision-making, meaning that some countries that were deemed prior to the pandemic to be well-prepared for a global outbreak, have fared extremely badly. But as exemplified by the global distribution of vaccines, inequality in pre-existing resources and political power have led to enormous disparity in access to the ability of populations to access effective means of preventing infection. It is all too clear that the dissemination of key resources in a pandemic cannot be left to the free market. However, equally it is clear that existing international institutions (that in theory were supposed to be able to coordinate global responses such as vaccines) were not capable of overriding the competitive and self-protective instincts that drove wealthy countries to arrange unilateral vaccine deals. Pandemics (like other global threats such as climate change and antibiotic resistance) pose collective action problems that require careful coordinated solutions.

Pandemic X

The experience of COVID-19 means that medicine, epidemiology, and public health will potentially be better-placed to face Disease X. This volume addresses the ethical and social lessons of the current pandemic. What lessons can we learn from the COVID-19 pandemic to prepare for future pandemics?

The international authors in this volume provide a range of different suggestions for such a future response. Here are some highlights:

In the first chapter, Larry Gostin suggests ways to make the response to Pandemic X more globally solidaristic: this might use versions of programs that already exist (for example COVAX), but considerably strengthened, globally distributed and resourced in advance. Other suggestions include new global pandemic treaties to support robust early detection programs as well as financial support to facilitate pandemic responses. It will be important for responses internationally and nationally to be ethically transparent in order to engender and maintain public trust. Allen Buchanan echoes this call, arguing that global institutions need to be reconfigured (or ideally a new one created) to enshrine and enforce a 'duty to rescue' on countries – so that wealthy countries do not renege from their obligations and resort to extreme national partiality in the face of a future pandemic threat. John Tasioulas argues for a more fundamental conceptual shift – suggesting that clarifying the scope and content of human rights is vital for ethical debate and discourse in pandemics. He also notes (highly relevant given some of the responses to COVID-19), the relationship between political structures and human rights in a pandemic.

In section 2, authors examine some of the challenge of conflicts between rights and public health in a pandemic. Jennifer Blumenthal Barby, Jessica Flanigan and Frances Kamm, in their respective chapters, examine public debates relating to individual freedoms, harms and choices in a pandemic. Blumenthal Barby identifies some complexities in the arguments used to support vaccine mandates, and ways that they need to be more nuanced for Pandemic X. Flanigan is critical of the resort to prohibitions such as mandates and lockdowns for the sake of public health in pandemics. She suggests that there should be a presumption against such policies in future pandemics. Kamm, from an opposite perspective, dissects the libertarian arguments against social distancing, mask wearing and vaccine requirements. She suggests that clear understanding of the nature of contagious threats would recast individual responsibilities in a pandemic - and mean that libertarians *should support* rather than oppose these various measures. One important question for future pandemics will be whether responses should be uniform, or may be different for different groups. Govind Persad and Ezekiel Emanuel compare some debates in relation to public health policies during the COVID-19 pandemic to the mythological story of Procrustes. (According to the story, the figure of Procrustes attempted to fit travellers to a single size bed (by either stretching them or cutting them to size).) They argue that the principle of the 'least restrictive alternative' means that in future pandemics, even if universal restrictions (eg masks/social distancing) are initially justified, they should be selectively eased for members of the population who no longer pose a risk of transmitting the virus or overwhelming the health system. One of the editors (JS) extends this argument by providing a principled ethical rationale for unequal liberty restrictions in a pandemic. He argues that a dualist consequentialist approach (incorporating both equality along with utility) could provide a basis for deciding when lockdowns or other measures should apply to all or only part of the community.

The importance of developing sophisticated ethical approaches for future pandemics is taken up in the third part of the volume. Matt Adler and colleagues examine the prospect for using a novel social welfare function as a way of quantifying the impact of different policy options and mathematically combining some of the competing ethical values. They illustrate the importance of modelling for identifying which policies are likely to be optimal (eg minimising economic costs and maximising welfare) and which values are most important to clarify. In chapter 10, one of the editors (DW) also defends a pluralist ethical approach. He points out that conflicts between values are more of a problem for some choices and dilemmas than for others. At least in the coronavirus pandemic, vaccine allocation posed a simpler ethical choice since different principles potentially converged on similar policies (prioritising the elderly and medically vulnerable). In other policy areas, there may not be a single correct way of reconciling conflicting ethical values meaning that we should expect (and not regret) some differences in international approaches. Owen Schaefer examines one such challenge – how to distribute doses of vaccines between countries. He proposes a hybrid model that attempts to combine elements of a population-proportionate (egalitarian) model with one based on needs. Although he is motivated primarily by uncertainty

in needs-estimation, such a hybrid approach could also give some ethical weight to the value of equal access. Christina Orfali, in chapter 12, examines a controversial question from early in the COVID-19 pandemic. She highlights the mixed experience of developing and implementing triage guidelines in the US and Europe. Whichever approach is taken to these difficult decisions for future pandemics, there are important lessons from COVID for how triage policies can be made transparent and accountable, and how public trust may be promoted.

As noted earlier in this introduction, pandemics can deepen social inequality and injustice. Mike Parker points out one important element that is relevant even before the next pandemic arrives. The burden and potential harms of surveillance and pandemic early detection programs (like those that detected the avian influenza outbreak in our example) will likely fall on some of the globe's most disadvantaged communities. There will need to be attention (and resources) devoted to meeting the world's obligations to those communities. Several authors catalogue and draw lessons from the unequal experiences of the COVID-19 pandemic. Sreenivasan Subramanian argues that preparation for pandemics needs to pay attention to basic needs of the population - nutrition, health and education. Those states in India that had strong social safety nets fared much better in responding to the COVID-19 pandemic. Political responses to the pandemic should resist the temptation to go 'big' - eg draconian policies that look impressive, and simultaneously, they must pay attention to the small - to the needs of those who might otherwise be 'invisible' - the marginalised and poor. Clara Dias and Oliveira highlight the disproportionate impact of the pandemic on those with pre-existing disadvantage. This within-nation social inequality intersects with factors that mark and manifest disadvantage - gender, sexuality, race and poverty. They provocatively argue that one of the most important steps that societies might take in preparation for the next pandemic is not directly pandemic-related at all - it is to recognise, take seriously and to urgently address structural injustice. But problems of inequality in a pandemic are not confined to low and middle income countries. Nakazawa and Akabayashi explore the unequal impacts of the pandemic in Japan. They suggest that future pandemic responses need to pay attention to those most vulnerable, not just to the infection, but also to the measures used to stop its spread, for example those suffering severe social isolation in a lockdown.

Finally, Lipshitz, Kahn and Faden, draw together some of the common strands of the volume. There are different voices included in this book, and areas of reasonable disagreement. But there are also important areas of consensus. Lipshitz and colleagues also highlight some areas that are crucial for thinking about future pandemic X, but which do not feature prominently in this work - including the challenge to democracy posed by public health crises, public-health governance, and the interests of children.

What will our response to Pandemic X look like? Some of the suggestions arising from this volume are included in the hypothetical avian influenza epidemic that begins this introduction. But is it realistic to think that we could (within 5 years) get to a position where we could respond to an outbreak of novel influenza or some other pathogen in such a coordinated, calibrated and sophisticated way? There are some reasons to be optimistic. Our recent experience has identified success stories as well as challenges. We have a reasonably clear idea of what we need to do differently for Pandemic X. The proposals summarised above and described in more detail through this book are achievable. Some people (you, for example), are interested enough in these problems to pick this volume up and engage seriously with these questions.

On the other hand, in a workshop that included most of the authors of this volume, our Japanese contributors noted the experience of severe earthquakes in Japan (for example the severe Tohoku earthquake in Fukushima in 2011, and the Great Hanshin earthquake near Kobe in 1995). Although these have occurred multiple times in modern history, when they occur anew, lessons appear not to have been learned. They attributed this to factors that may be relevant for thinking about Pandemic X. First, collective memories of tragic events (earthquakes, pandemics) fade with time, meaning that attention and motivation diminish if there is a long gap between events. We may be better off in some ways if the next pandemic threat arises in 2027 than if it does not come until 2047 (though for purely selfish reasons, most readers we suspect would share our own preference for the

latter!). Second, preparation for future disasters requires significant resources. It can be difficult to attain and maintain sufficient commitment to this when the timing and magnitude of future disasters is unknown. Third, when future outbreaks occur they are likely to be different in important ways from those that occurred previously. Some of the responses that were important for COVID-19 and some of the lessons may not be relevant or apply straightforwardly to the next pandemic when it comes.

So we must not underestimate the challenge we face. Pandemic X will test us, in ways that we can predict and in ways that we cannot. Moreover, preparing for pandemic X will cost us. There will be things that we will have to forego to invest in the things that we need— whether those are equipment or food stockpiles, early detection systems, policies and processes for decision-making, global treaties and institutional reform. But at least some of these will have spin off benefits that will be valuable for our communities even if the next pandemic does not arrive for 50 or 100 years. Investing in our health care systems, addressing socio-economic disadvantage and inequality, and building global capacities in vaccine production (as well as global understanding of vaccination) are important general purpose social goods. Developing ethical frameworks for public health interventions and resource allocation (drawing on engagement with the wider community as well as rigorous ethical analysis) will help us to be ready for other non-pandemic health crises that we are likely to face. Finally, if we can recognise that pandemics pose a global shared problem and existential risk, if we can come together to develop pandemic treaties and collective response plans, that may help us to address some of the other great existential risks and collective problems of our age.

One element of preparation for Pandemic X is not necessarily highly costly. As the rest of this volume makes clear, ethical analysis, ethical reflection and ethically informed decision-making are vitally important to pandemic response. We need to take advantage of our recent experience and learn from the lessons of the COVID pandemic. In advance of another crisis, we need to publicly discuss and debate the values and the approaches that we should use, identifying what we are willing to sacrifice, and what we should prioritise. We need to educate our policy makers to recognise the ethical dimensions of their decisions, and build into our policy making institutions expertise that can provide critical and constructive ethical advice.

We ignore these challenges, and these preparations at our peril.

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