



The Perfect Moral Storm: Diverse Ethical Considerations in the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic has both exposed and created deep rifts in society. It has thrust us into deep ethical thinking to help justify the difficult decisions many will be called upon to make and to protect from decisions that lack ethical underpinnings. This paper aims to highlight ethical issues in six different areas of life highlighting the enormity of the task we are faced with globally. In the context of COVID-19, we consider health inequity, dilemmas in triage and allocation of scarce resources, ethical issues associated with research, ethical considerations relating to tracing apps, and exit strategies such as immunity passports and COVID-19 vaccines. Finally, we consider environmental issues in light of COVID-19. The paper also offers some ethical reflection on these areas as many parts of the world contemplate the recovery phase.

Keywords COVID-19 · SARS-CoV-2 · Health inequity · Triage · Resource allocation · Tracing apps · Immunity passports · Vaccines

Introduction

The novel coronavirus SARS-CoV-2 emerged in Wuhan, China, in the final months of 2019 and has swept through nearly every country in the world, with more than 4 million confirmed cases and close to 300,000 attributable deaths, as of 11 May 2020 (Johns Hopkins University 2020). The disease caused by the virus—COVID-19—is mild in the majority of infected persons, particularly those below the age of 50 years (Wu and McGoogan 2020; Ferguson et al. 2020). The need for hospitalisation and the

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risk of dying rise dramatically above this age and, in those with comorbid conditions, approaching 30%, and 10% respectively in persons aged above 80 years (Ferguson et al. 2020).

The local epidemics in each country have exposed health and social inequities in glaring fashion, with a greater impact on vulnerable and disadvantaged populations. Its rapid spread has threatened to overwhelm the healthcare system in many countries, and, in particular, their critical care units (Grasselli et al. 2020; Xie et al. 2020). This has led to heated discussion and debate about rationing of medical treatments even as attempts to ramp up medical facilities for treating COVID-19 patients have simultaneously taken place (White and Lo 2020).

In an effort to control the spread of SARS-CoV-2, countries have employed a wide range of interventions including travel restrictions, contact tracing, quarantine, and, at the extreme, lockdowns of cities, regions, and whole countries. An increasing number of countries, including, for example, Israel, Iran, and South Korea, are tapping into their population's phone location data to detect persons in close contact with COVID-19 cases as well as to monitor their compliance to imposed quarantine measures, while the European Data Protection Board released guideline regarding how and what personal data harvesting and processing can lawfully take place during the pandemic (European Data Protection Board 2020a, b).

At the time of writing, a third of people in the world are living in countries and territories where lockdowns are in place (Campbell 2020). Such lockdowns impose considerable socioeconomic pain, particularly amongst the poor and marginalised segments of society. In addition, lockdowns may negatively affect people's mental health (Wilder-Smith et al. 2020). In countries where the first wave of the epidemic has been brought under control, there is ongoing discussion about how and when to exit lockdowns, and to restart the economic engines of growth. In this context, questions about the use of 'immunity passports'—which are certifications of immunity to COVID-19 that could be an option to allow people to return to work or to travel—are starting to be debated.

There is a tremendous need for research in all areas of the COVID-19 pandemic ranging from understanding the virus and therapeutics to population-level interventions and research into its socioeconomic impact. While the majority of scientific studies have been rigorously performed despite the speed of work, others have been faulty and misleading, amplified by the accelerated publication on preprint servers (Sharma et al. 2020).

In this article, we aim to highlight the great diversity of ethical issues that COVID-19 has raised by addressing six disparate areas: Health Inequity, Triage/Resource Allocation, Research Ethics, Data Privacy and Tracing Apps, Exit Strategies, and COVID-19 and the Environment. We discuss the salient aspects of these issues, which will need to be contextualised for each society, debated, and acted upon as each society passes through the different phases of the pandemic and its aftermath. At this point, how the pandemic will end is uncertain, with many low- and middle-income countries still at an early point of their local epidemics. Much hope has been placed in vaccine development, but clinical trials have barely begun for the lead vaccine candidates. The vast range and complexity of these ethical issues have contributed to the increased uncertainty we are facing in every aspect of our lives globally.

Health Inequity

The distribution of health outcomes has always been unequal in the wealthiest and in the poorest of nations. However, it was recently suggested that COVID-19 is ‘the great equaliser’¹. On the surface, this may appear to be so as the disease impacts the unknown poor and princes and heads of state alike, but it is far from ‘the great equaliser’, as this section aims to highlight.

When the distribution of power, money, and resources systematically disadvantages some individuals and groups, this leads to *avoidable* differences in health outcomes, referred to as *health inequity*, within countries but also between countries (Marmot et al. 2008). Certain groups, (e.g. migrants, refugees, the unemployed, the homeless, those with limited access to basic health care) experience greater health inequities not necessarily as a result of being born into a particular group but because they are exposed to multiple levels of disadvantage which place them at greater risk of experiencing poorer health outcomes (NSW Department of Health 2004). While structural injustice often prevents members of such groups from achieving their potential and flourishing, it simultaneously enables others to benefit disproportionately by making available to them more opportunities to develop their potential (Young 2006).

In the context of a pandemic, such groups are significantly more vulnerable as a result of the social determinants of health they are exposed to and the inter-related nature of their effects. For example, the most basic and effective public health measures to reduce the spread of disease, social distancing and hand hygiene (World Health Organization 2020a), may be unattainable to millions. Sub-optimal living arrangements impact significantly on health often because of overcrowding and reduced access to sanitation and water which, during a pandemic, leaves millions exposed (World Health Organization 2020b). The dire consequences of overcrowding have been experienced in Singapore where COVID-19 clusters have been identified in relation to migrant workers living in crowded dormitories (Chew 2020). The surge in these cases has had a significant impact on the healthcare system (Khalik 2020) and has thrust Singapore into a higher level of risk, as the spread of the virus amongst these migrant workers has proven hard to control. Despite initial enviable success resulting from effective control measures, Singapore has not been immune to the significant health and economic consequences of structural injustice.

Earlier on in the pandemic timeline, when unemployment levels soared overnight as a result of the urgent need to accelerate social distancing measures, governments of wealthy nations around the world identified substantial reserves and have temporarily provided some financial relief, in some cases doubling unemployment benefits they had previously adamantly refused to for years as a means of discouraging welfare reliance (Wilkins et al. 2019). Both governments and citizens of wealthy nations often hold the perverse view that social disadvantage has little to do with structural injustice; rather, it is viewed as an outcome of individual failure, laziness, and unwillingness to contribute to society in a productive way (Fothergill 2003). However, often in ignorance, we all contribute to the perpetuation of structural injustice by virtue of our engagement in its

¹ Governor of New York, Andrew Cuomo (@NYGovCuomo), Twitter, 1 April 2020. <https://twitter.com/nygovcuomo/status/1245021319646904320?lang=en>

elements and conventions, which help organise and give meaning to our lives (Young 2006). For some, the COVID-19 crisis has been the first time in their lives they have stepped into the shoes of the disadvantaged as they patiently wait their turn to collect food donated to food banks (Vesoulis 2020). The humiliation, loss of dignity, and stigma associated with receiving welfare are now being felt and understood by people who could never have imagined what it means to rely on others for survival (Fothergill 2003). Personally devastating experiences of this nature could perhaps prompt more in the coming months and years to recognise not only their sphere of responsibility but also their sphere of influence in correcting structural injustice (Young 2006), which leads to health inequity.

Even when employment has been retained by those who are already socially disadvantaged, job and financial insecurity may lead to a reluctance to seek timely medical assistance in cases where workers experience early symptoms of the disease. This not only compromises their chance of regaining health if they contract COVID-19 but also puts at risk others who may contract the disease from them. Similarly, in countries that do not have universal health coverage, and where health insurance is accessible only via employment, inability to access health insurance or being under-insured precludes many from seeking medical assistance (Collins et al. 2019).

Health inequities experienced in childhood persist into adulthood producing poor physical and mental health outcomes. We have already witnessed that African Americans are contracting and succumbing to COVID-19 at disproportionately higher rates than their representation in the population, likely due to comorbidities recognised as risk factors for COVID-19 complications (Yancy 2020), which disadvantage them in the fight against the disease. For example, at the time of writing, 56.25% of deaths in Louisiana related to African Americans while only 34.34% were deaths relating to White Americans (Louisiana Department of Health 2020) even though African Americans comprise 32.7% of the population while White Americans comprise 62.9% (United States Census Bureau 2019). The very existence of underlying comorbidities further disadvantages patients during public health emergencies, as their existence contributes to triage and allocation decisions to their disadvantage when health systems become overwhelmed (Kuschner et al. 2007). In addition, disadvantaged groups may also be at increased risk of contracting the virus both because they continue to work in high-risk frontline jobs and because of overcrowded living arrangements, which contribute to the spread of infectious diseases, in addition to other detrimental effects to overall physical and mental health (Marmot et al. 2020).

Children are not immune to the inequities this pandemic has exposed. Education plays a significant role in children and young people's health and wellbeing. In addition to helping develop numeracy and literacy skills, education provides the opportunity to develop core cognitive, emotional, and social skills; it is the context within which health education can be imparted, as we have seen in the current crisis with young students learning about hand hygiene; it provides opportunities for children to engage in physical activity; and the higher the educational attainment, the better the job prospects enabling young people to break away from poverty and health inequity (Hahn and Truman 2015). In the current crisis where schooling in many jurisdictions is continuing remotely via the Internet, disadvantaged children are at a further disadvantage as they cannot always participate. Unless resolved, this will set them back even further educationally, health wise, and perhaps even psychologically, as it dawns upon

them that they are different from their peers. Schools also play a key role in providing nutritious food, particularly through the World Food Programme (WFP et al. 2020), and sometimes by law (e.g. US Child Nutrition Act 1966²). Where required by law, food distribution networks have been set up if schools are not operational but in countries where food provision is part of a programme not mandated by law, children may miss out on the one nutritious meal they used to have per day despite the efforts of international organisations (WFP et al. 2020).

There is a renewed urgency to, firstly, acknowledge and then address health inequities in the face of COVID-19, which has brought to the fore the desperate circumstances of millions of people as they play out differently for different groups. A renewed commitment to reducing health inequities is particularly important as economies attempt to recover from this pandemic. Ultimately, addressing health inequities will lead to more robust economies, greater productivity, and greater social wellbeing (Marmot et al. 2010).

It will be impossible, however, to properly restructure and open up economies if the false dichotomy between public health and the economy continues to dominate our thinking. Central to both economic recovery from COVID-19 and to resolving long-standing health inequities is the realisation that the health of populations and the economy of nations are intertwined and interdependent; a nation's health can crumble the most robust of economies, as COVID-19 has highlighted, and the shutdown of economies can exacerbate health inequity and also destroy the lives of those previously advantaged. Health experts, scientists, and governments, with support from international agencies, must work together closely and harmoniously to carefully and strategically restart dormant economies while protecting, to the greatest extent possible, the physical and mental health of all citizens, including, importantly, those who are systematically disadvantaged.

Triage/Resource Allocation

One of the dreaded features of the COVID-19 pandemic is that, if not contained or delayed, the sudden surge of patients requiring intensive care will overwhelm even well-equipped health systems (Emanuel et al. 2020). In such a scenario, difficult decisions have to be made involving the allocation of scarce medical resources: who gets to stay in intensive care beds? Which patients are to gain access to a limited number of ventilators (Mounk 2020)?

Decisions about the rationing of resources that arise in the context of COVID-19 extend beyond those that are directly related to patient care. Health officials may, for instance, have to make rationing decisions about personal protective equipment (PPE) for healthcare workers (Centers for Disease Control and Prevention 2020) and hospital administrators may have to make decisions about how to allocate their limited staff (Chopra et al. 2020), particularly as they are impacted by the disease themselves. Decisions about rationing also remain relevant in later stages of the pandemic or in stages of easing of lockdown restrictions. For instance, serological tests to prove

² See 42 U.S.C Chapter 13A, Food and Nutrition Service, US Department of Agriculture, <https://www.fns.usda.gov/child-nutrition-act-1966>

immunity to COVID-19 have been proposed to allow people to return to work (Greely 2020; Smith 2020). Assuming limited testing capacity, policy-makers might need to decide which parts of the population get to undergo such testing first. However, the kind of triage and resource allocation decisions that directly relate to life-saving patient care are, arguably, the most morally fraught ones.

While clinical facts and indicators are relevant to making such decisions, they would not settle the ethical dilemmas by themselves. In the context of triaging, decisions may have to be made about allocating a scarce medical resource, such as a ventilator, amongst patients for all of whom the use of the resource is clinically indicated. Moreover, such decisions should not be made ad hoc by individual clinicians or institutions since this would risk them becoming inconsistent and arbitrary (Emanuel et al. 2020). Instead, guidelines are needed and there have, indeed, been various attempts to provide these (Vergano et al. 2020; Sokol 2020; New York State Task Force on Life and the Law 2015).

It is important to recognise that these guidelines and the goals that they advance ultimately need to rest on ethical values, some of which may be in conflict. To illustrate, many guidelines, at least implicitly, try to advance goals like ‘utility’ and ‘equity’ (Ballantyne 2020; Schmidt 2020), even if they are sometimes placed under different labels. ‘Utility’ would be understood as trying to maximise the number of lives saved, while ‘equity’ refers to the idea that every patient should get an equal chance of receiving the life-saving care that they require. However, there is an important tension between honouring these two values (Ballantyne 2020): in order to maximise utility one would be led to discriminate against those who have, for instance, pre-existing medical conditions, or those who are simply of old age, in virtue of the fact that these people have lower chances of recovery. Meanwhile, considerations of equity would condemn such discrimination and, instead, require that everyone, regardless of demographic features or pre-existing conditions, is given equal consideration.

Guidance needs to balance these competing ethical factors in some way but discussions cannot be informed by theoretical considerations alone without taking into account the shifting nature of decision-making in disaster responses. While a strong foundation of ethical standards must exist, during public emergencies, care delivery can be impacted along the continuum of *conventional*, *contingency*, or *crisis* standards of care; for example, when surge capacity is exceeded, as has already been witnessed around the world with COVID-19, it will be necessary to reallocate a scarce, life-saving resource (Institute of Medicine et al. 2012). In such instances, even with the availability of institutional guidance in the form of incident-specific prognostic indicators, healthcare professionals will nevertheless still be called upon to judge which patient will benefit most (Institute of Medicine et al. 2012). If prognostic factors did not form part of the decision-making, patients who might have survived would die and patients with poor prognostic factors might also die (Institute of Medicine et al. 2012), squandering life-saving resources when most needed. A relevant consideration here is that efficient and ethically robust decision-making in healthcare institutions forms part of a broader disaster response framework that takes into account all the systems and relevant stakeholders that engage in such responses and which, as a whole, needs to rest on carefully considered ethical foundations and legal considerations (Institute of Medicine et al. 2012). Because decisions will ultimately be guided by preferencing some values over others, it is particularly important that procedural values such as transparency,

consistency, proportionality, and accountability hold a prominent place in the decision-making (Institute of Medicine et al. 2012).

Apart from the substance of triaging and resource allocation guidelines, there are also important ethical questions concerning procedural aspects of applying them. One view is that it would be unfair to burden clinicians with having to make decisions about withholding or withdrawing treatments for reasons not strictly related to the potential treatment benefits for their patients in the context of scarcity (Truog et al. 2020). Proposals have been made to relieve clinicians from having to make decisions themselves and instead involve ‘triage panels’, ‘composed of volunteers who are respected clinicians and leaders amongst their peers and the medical community’ (Truog et al. 2020). This proposal appropriately attempts to minimise the emotional toll on treating healthcare professionals given the increased rate of patient death they will be/are being exposed to. Furthermore, it coheres with proposals in the context of crisis standards of care; in addition to multiple other components, clinical processes should include contributions from (national) or state disaster medical advisory committees, local clinical care committees, and triage teams, which helps promote consistent and coordinated decision-making (Institute of Medicine et al. 2012). Despite concerted efforts, however, the intricacies of adopting the right triage model are enormous and we need to acknowledge that there is no perfect model.

Research Ethics

Global desperation for effective COVID-19 treatments and preventative interventions is understandable given the global impact of the disease. Biomedical research is an essential component on the road towards recovery from the pandemic. In particular, a successful vaccine would not only prevent disease spread and thereby save lives but would also lessen the need for restrictive social distancing measures that have had tremendously negative impacts on the economy and individuals’ well-being. Research into COVID-19 therefore has potentially great social value, and diversion of resources (financial as well as human capital) from other biomedical projects towards research into effective COVID-19 therapeutics is well justified in light of the critical nature of the current crises and the substantial social value that could be gained.

Some have gone further, asking whether we should ‘cut corners’ in terms of subject protection in order to advance research (Savulescu 2020). However, the basic principles of research ethics, like harm minimisation, respect, and fairness, should not be suspended due to this international emergency (WHO Working Group on Ethics and COVID-19 2020). The interests of research participants still need to be adequately protected by existing mechanisms, even if these mechanisms are reasonably adapted to the circumstances.

Adaptation in publicly declared emergencies may take several forms and should ideally be guided by preparedness plans for emergency research ethics review developed by IRBs and their institutions prior to the emergence of the crisis (Canadian Institutes of Health Research et al. 2018). This is particularly important so that ethical review in such emergencies is not compromised and so that logistical issues have a well-thought out response. If such a plan has not been developed and activated, one of the most straightforward adjustments is accelerated ethics review of COVID-19-related

protocols (Green 2020). However, the quality of ethics reviews must not be compromised despite the time constraints and it may be necessary for IRB members to receive urgent training on the distinctive ethical issues raised in the context of pandemic research, for external experts to be called upon to contribute, or for Chairs to take executive action where appropriate. This accelerated review process will likely demand more time and effort from ethics committees, as additional meetings may need to be convened. Usual proportionate review considerations would continue to be implemented so that if the level of risk to potential participants is low, the approval process should be accelerated at even greater speed during an emergency. Maintaining independence while navigating these demands need not require that IRBs receive no support; one important function of regulatory stewardship of research is for stakeholders (including regulators and institutions) to provide mutual support, especially in times of crisis (Laurie et al. 2018). This could, for example, take the form of guidance on adapted ethics review for COVID-19 studies, particularly where there is no IRB preparedness plan in place.

Approaches to study design may also be appropriately adapted in light of the global nature of this crisis. One welcome development has been the substantial, even unprecedented, level of international collaboration and cooperation in research and development (Lau 2020). In this vein, the WHO has proposed numerous candidate vaccines be tested in a single coordinated international controlled trial. It is called the ‘Solidarity Vaccine Trial’ (WHO R&D Blueprint 2020), reflecting the perspective that around the world we are all impacted by this crisis, and therefore must work in concert to resolve it.

A questionable adaptation is tolerating higher risks amongst participants than would normally be permitted. For example, in the USA, a phase I safety trial for a candidate vaccine is said to have commenced before animal models had been completed (Boodman 2020). This exposes participants to greater risk than would normally be tolerated because the completion of animal models might reveal unacceptable side-effects (Lurie et al. 2020). By comparison, during the Ebola outbreak, the WHO criteria for fast-tracking vaccine trials explicitly required that ‘...100% efficacy had been documented in non-human primates with acceptable pre-clinical safety’ (World Health Organization 2015, 6). COVID-19 has spread more rapidly and widely, killing far more people around the world than Ebola. This differing context may be offered as a reason to tolerate higher risks for participants in order to accelerate vaccine developments. But by the same token, scrutiny of any vaccine or the safety or efficacy of treatments remains paramount in order to ensure any intervention ultimately offered on a large scale is actually worthwhile (Le et al. 2020; London and Kimmelman 2020).

Over-recruitment in public health emergency research is a potential problem IRBs need to consider. While many are eager to promulgate experimental treatments as widely as possible while gathering valuable research data, (Mishra 2020) recruiting more subjects than are needed to achieve a study’s scientific aims is concerning for several reasons. First, over-recruitment may unnecessarily delay the completion of a study and the timely dissemination of the information on an intervention’s effectiveness or safety. Second, over-recruited participants will be subjected to burdensome and potentially risky research tests unnecessarily (Altman 1980). And third, over-recruitment may exacerbate already limited supply of experimental drugs. Further limiting supply is particularly concerning when the drug is already approved for

treatment of other conditions, and patients find it more difficult to access those treatments (Mehta et al. 2020). Supply limitations may also undermine the voluntariness of participation, as individuals agree to research interventions, they might otherwise prefer to avoid, in order to get access to a promising intervention. IRBs must carefully evaluate the scientific merit of sample size calculation to promote wide-ranging ethical considerations.

Adverse drug effects and the use of placebos in trials for drugs to combat deadly viruses also factor into IRBs' considerations (National Academies of Sciences, Engineering, and Medicine 2017). Some will argue that the higher the risk of death due to the virus, the lower the ethical concern about risks of adverse effects; similarly, the greater the risk posed by the virus, the greater the ethical concerns there are regarding assignment to a placebo arm of a trial (National Academies of Sciences, Engineering, and Medicine 2017).

In light of the urgency of generating knowledge relating to COVID-19 and potential treatments, there is increasing circulation of novel findings via preprint and working papers, prior to the completion of peer review (Majumder and Mandl 2020). While preprints have the advantage of quickly disseminating relevant findings during a crisis whose ramifications grow each day, the value of that information may be undermined by errors and mistakes that peer review would normally (if imperfectly) correct. For example, as of 9 May 2020, *Retraction Watch* has identified six retracted COVID-19 papers or preprints (Retraction Watch 2020).

Due to the large public interest in rapid COVID-19 therapeutic drugs, there may be substantial political pressure to accelerate development. This is most evident in the USA, where the President repeatedly questioned the long-projected timelines for vaccine developments, and advocated for therapeutics that, as of this writing, remain of unproven effectiveness (Allen 2020). Political pressure may also occur in more subtle forms elsewhere, but IRBs and researchers alike should be careful in this regard and should be guided by experience from previous epidemics and outbreaks. One useful approach to promoting fairness and respect towards participants and communities in research during public health emergencies is to systematically incorporate robust community engagement that can have a meaningful impact on study design and research practice (Nuffield Council on Bioethics 2020; Marston et al. 2020).

Data Privacy and Tracing Apps

Infectious disease surveillance systems can be responsible and proportionate, so long as adequate protections and governance structures are in place. This includes privacy protections like recording unique identifiers instead of personal names, where practicable, (Bayer and Fairchild 2004; Gilbert et al. 2019) and/or limiting sharing of personal information on a 'need-to-know' basis (Kass 2001). These general considerations are not new, but the COVID-19 pandemic is in many ways more urgent and devastating than previous outbreaks, further justifying some degree of intrusion into personal privacy via surveillance, but still constrained by conditions of good governance and data protection.

A unique emergent feature of the COVID-19 pandemic is the current technological context with high smartphone usage in many nations. This has prompted a number of

countries and companies to develop contact tracing smartphone applications (Orphanides 2020; Baharudin and Wong 2020; Evans 2020). These applications use Bluetooth and/or GPS data to record when different individuals running the app are near each other. If one user is later found to be infected with COVID-19, the app can then be used to quickly identify those with whom they had been in contact—potentially much faster than traditional contact tracing methods of interviewing individuals and retracing geographic movement. As a supplement to traditional contact tracing interview methods, such apps help identify proximate contacts of infected individuals who might otherwise have gone unnoticed. Those who have been in contact would be informed and advised of the relevant guidelines to monitor their own health and self-isolate to prevent further spread to others (Ferretti et al. 2020).

In this way, the app could benefit both the user (by helping pre-emptively identify personal COVID-19 risk) and society (by more efficiently identifying individuals who should be isolated). Widespread use of contact tracing apps could also assist in speeding the recovery from COVID-19, as part of a multi-pronged approach to ‘open up’ societies and economies while mitigating the risk of disease resurgence. This would involve not only app-assisted contact tracing but also vigorous and widely utilised testing, with rapid, coordinated response by public health officials to new cases (Resnick 2020).

While the potential benefits are substantial, some may worry that contact tracing apps would facilitate overly draconian and intrusive public health interventions (Washington Post Editorial Board 2020). Certainly, if public health authorities are prone to taking excessive and unjustifiable action when learning someone has been in contact with a COVID-19 patient, any intervention that improves contact tracing may lead to further injustice. Like all public health interventions, contact tracing apps must be deployed under conditions of trustworthy governance that would prevent such excesses. The use of apps may come with further privacy risks. The generation and storage of Bluetooth and/or GPS data, even if encrypted, are a potential source of a data breach. Perhaps more concerning, though, is potential misuse by state or private app developers who could have more direct access to data for purposes other than public health surveillance. For example, some are concerned that states could potentially share the data with law enforcement, for the purpose of monitoring purported contacts between those suspected of crimes. A more troubling and corrupt use would be to track the activities of political dissidents, with the aim of suppression of opposition. For private actors, the data might be useful for commercial purposes, such as marketing wellness products to individuals exposed to those diagnosed with COVID-19, or more generally using location data to build consumer profile and inform market analytics.

These uses of contact tracing app data beyond the primary health-promoting purposes are illegitimate, for several reasons. Firstly, using the data for other purposes subverts the reasonable expectations of those who download the contact tracing app, with the express purpose of protecting themselves and others around them from COVID-19. Burying clauses permitting secondary uses of the data in the app’s terms of service does not serve as adequate authorisation of those uses, as most users are unlikely to read those terms in full (Bakos et al. 2014). Secondly, secondary uses go beyond the central justification for the gathering of such sensitive data, namely, the promotion of population health. Consent is not sufficient to license the risks imposed, in particular due to information asymmetry between app user and developer (Véliz 2020). Finally, those

secondary uses are likely disproportionate. Privacy risks from contact tracing apps may be acceptable due to the great potential public benefits from their use, but their justification is more questionable for uses with less substantial benefit.

The substantial social value of efficient contact tracing in a time of COVID-19 crisis plays a crucial justificatory role in the promulgation of contact tracing apps. By contrast, while there may be some value in other uses such as criminal contact identification or even marketing, that value is substantially more limited than the value of contact tracing during this pandemic; a consideration of dual uses of such apps in a pandemic will likely lead to their failure. In addition, publics may reasonably fear sliding into a ‘surveillance state’ during a time of crisis, and slippage in terms of the scope of data use would further normalise intrusive monitoring that may lack appropriate scrutiny and justification. Wide uptake of such apps is required for their success but this will only be achieved if transparent disclosures regarding their features and capabilities are made available. Specific provisions resembling sunset clauses may also allay fears about illegitimate privacy-threatening uses by states but, ultimately, it is trust or lack thereof that will no doubt be the deciding factor in their uptake.

Exit Strategies: Immunity Passports and COVID-19 Vaccines

The health impact of SARS-CoV-2 may well be matched by the socioeconomic impact caused by the pandemic and the measures taken to slow its spread (Nicola et al. 2020). Enhanced social-distancing measures (such as lockdowns) that have been implemented across many countries to curb the spread of COVID-19 may negatively affect the well-being of individuals (Enserink and Kupferschmidt 2020). For example, there are concerns that such measures may increase suicide rates because they negatively affect the economy, increase social isolation, and reduce access to support networks (Reger et al. 2020). Concerns have also been raised about the increased risk of domestic abuse (Nicola et al. 2020), reduced physical activity (Yorkshire Cancer Research 2020), increased risk of internet and gaming addiction (Kharif 2020), and increased alcohol consumption (Yorkshire Cancer Research 2020). This is not to argue that enhanced social distancing measures are of no benefit. In fact, such measures may be said to be a ‘necessary evil’ in tackling the COVID-19 pandemic (Lippi et al. 2020, 89). However, this means that the decision as to when and how such measures may be lifted requires a nuanced and well-balanced consideration of not only their benefits in helping to reduce the spread of COVID-19 and their negative effect on the economy but also their impact on individuals’ wellbeing and measures that could be taken to reduce their impact on the wellbeing of individuals.

The issue of how people may safely return to work and/or travel, particularly in countries and cities in lockdown, is particularly pressing. In this regard, many experts and government officials have discussed the possibility of issuing ‘immunity passports’ to those who have recovered from COVID-19 as well as—in the future—those who have been vaccinated. Chile is set to be the first country to attempt this (Bartlett 2020). At this time, however, there remains considerable uncertainty around immunity to COVID-19. The length of immunity post-infection is unknown and may not be lifelong, in keeping with other coronavirus infections (Payne et al. 2016). Serology tests at present have varying performance characteristics, with significant rates of false-

positive and -negative results particularly in currently available rapid lateral flow assays (Infantino et al. 2020).

Given the uncertainty around the scientific facts concerning immunity as well as the reliability of serology tests, careful consideration must be given to the ethical issues underlying decisions to issue immunity passports. In addition to potentially prolonging the spread of COVID-19, it may be that, in our efforts to benefit society and our economies, we create yet another type of inequity. This could arise from the limited availability of tests, which disadvantaged people, who are most in need of work, may not be able to access, especially if they have no one to advocate for them.

A considerably more reliable exit from the global health and economic crises will be the development of a vaccine. In recognition of the critical role a vaccine will play in the recovery efforts worldwide, fervent efforts are being made by multiple research groups around the world. While there are currently more than 70 vaccine candidates in various stages of development, there has never been any commercially available coronavirus vaccine for humans, and given the issues surrounding immunity to naturally acquired COVID-19, there is little certainty that an effective long-lasting vaccine can be developed. This is a confronting prospect which would alter the known way of life for a long time to come.

There are, however, ethical considerations even if a vaccine was successfully developed, as it would initially be scarce. This would require, once again, rationing decisions about how to prioritise access to it. A 2007 review of National Influenza Pandemic Plans revealed that the groups given the highest priority in the plans of 11 nations were the high-risk groups usually prioritised during regular influenza vaccination periods (Straetemans et al. 2007) (e.g. the elderly and individuals with conditions such as asthma, diabetes, emphysema, or coronary heart disease). Given the virulence of COVID-19 and its potential to quickly overwhelm healthcare systems, it may be that usual access policies prioritising these high-risk groups would need to be reconsidered so that frontline workers, such as healthcare staff and first responders, get top priority in order to be able to continue servicing communities.

The initial scarcity of a vaccine may also lead to inequitable distribution globally with wealthier nations benefiting before poorer nations. This would be devastating as poorer nations are in greater need of protecting large populations which have limited ability to fight the virus on an equal footing due to under-developed healthcare systems, sub-optimal living conditions, and poverty.

COVID-19 and the Environment

Rigorous examination of scientific data over the past 50 years definitively supports the view that human activity has had a significant impact on global warming, which cannot otherwise be justified or explained by natural causes (Royal Society n.d.; NASA n.d.). The outlook for the future is frightening but the actual impacts on each of our lives difficult to fathom even if we have already glimpsed the future.

...all model projections indicate that Earth will continue to warm considerably more over the next few decades to centuries. If there were no technological or policy changes to reduce emission trends from their current trajectory, then

further globally-averaged warming of 2.6 to 4.8 °C (4.7 to 8.6 °F) in addition to that which has already occurred would be expected during the 21st century...(Royal Society *n.d.*)

Climate change is impacting and will continue to impact all aspects of human life from ecosystems, marine life, food and water security, infrastructure and human security, and health (Press et al. 2019) and we have already witnessed extreme climate events attributable to climate change (van Aalst 2006; van Oldenborgh et al. 2020), which have devastated communities, have impacted the livelihoods of millions, and have strained economies in repeated recovery efforts. While all suffer significant losses and physical and mental health consequences from extreme climate events, it is groups that are already disadvantaged that are most affected (Preston et al. 2014), as they often have fewer means to recover.

Climate change needs to be viewed as inextricably linked to health rather than as a separate issue that will drain economies. Scientists and environmentalists such as natural historian, Sir David Attenborough, have been urging global communities and governments to heed the warnings before it is too late to mount an effective response. Despite the devastation to human life, livelihoods, and economies worldwide, COVID-19 has revealed to us the global transformational changes to the environment resulting from the dramatic reduction in industrial activity, travel by plane, and commuting to work by car (Henriques 2020; Schuijers 2020), stunningly portrayed in satellite imagery.

COVID-19 has demonstrated that it is possible to shift to less resource-intensive means of production in some industries/sectors. For example, forcing everyone to telecommute has revealed which industries can maintain productivity with such interventions. Such industries may, with proper incentives, be able to maintain this shift long term. At the same time, we are presented with an opportunity to view the world in a more holistic and realistic manner; COVID-19 has demonstrated so starkly the interconnectedness of all human life and human activity, so we can perhaps now see more clearly that the environment is interlinked with our economies, our livelihoods, our health, and our wellbeing. We have followed the science in dealing with the pandemic; perhaps we now also have the opportunity, with the deep insight gained, to follow the science to protect the environment. As we have come together to defeat COVID-19, so too we can come together to map out how our economies can prosper while also protecting the environment.

Conclusion

In this paper, we have attempted to highlight the diversity of ethical considerations we are confronting and for which lucid, cogent ethical justifications will need to be provided for actions taken in areas of life affected by the COVID-19 pandemic. The uncertainty we face now will be replaced with reflections in months and years to come and with renewed ethical obligations as we look to the future.

If any lessons have been learnt, we will tackle health inequities with renewed determination to eradicate many of these and simultaneously benefit our economies; we will remember those who could not be saved despite our best efforts to attend to all and will console ourselves that the decisions were ethically robust, fair, and

procedurally sound; we will honour the scientists and those who facilitated their research and celebrate breakthroughs that saved lives; and we will reflect on the new role of technology in protecting health and advancing public health measures, while also respecting our need and desire for privacy. Only after the crisis, both health and economic, will we be able to ascertain whether we adopted fair and useful strategies to return to ‘normal’ life and human activity. Finally, this pandemic has also given us an understanding of how we might move towards tackling an equally devastating global disaster in the making: climate change. Harnessing the insights we have gained, we may look back on 2020 and acknowledge that all the lives lost were not in vain because this disaster helped us solve a crisis equally central to (human) life.

The need to set aside differences and collaborate on global issues that impact on our health, well-being, and survival has become increasingly evident. Now is the time to take a new direction and a new approach as we learn to live with COVID-19 and prepare for the next pandemic.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

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