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COVID-19: Ethical guidelines for the Exit Strategy

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MAIN POINTS:

MAIN RECOMMENDATIONS	ETHICAL JUSTIFICATION
Lockdown is an extreme measure more easily justifiable early on in a pandemic and for a short period of time. At this point, other solutions should be prioritized	Lockdown is burdensome and its public health benefits are unclear. The less restrictive alternatives recommended in this document are likely to strike a more reasonable long-term balance of competing values of lives, health, healthcare delivery, freedoms, fairness, and collective wellbeing. Prioritizing them would be consistent with an ethical principle of selecting the least restrictive option in public health.
Shielding the elderly and individuals with certain pre-existing medical conditions	Selective shielding of certain vulnerable groups would infringe on the freedoms of fewer people than full-blown lockdown. It would have both individual and collective benefits as it would reduce the number of deaths and it would not constitute unfair treatment of these groups. Shielded individuals would gain significant benefits in terms of reduced risk of death.
Implementing more effective testing and contact-tracing, including through contact-tracing technology (mobile apps)	These measures have been shown to be effective at containing the virus in countries where they have been successfully implemented. They entail some privacy infringement, but the possible harms are likely to be outweighed by both individual and collective benefits.
Quarantining individuals likely to have been exposed to COVID-19	Quarantine involves no individual benefit for those quarantined and there are some costs for those who are subject to it, but it entails a very large collective

MAIN RECOMMENDATIONS	ETHICAL JUSTIFICATION
	benefit. The justification for selective quarantine would be stronger if those subject to it were adequately compensated.
Keeping schools open	Closing schools would unfairly burden children, because they are unlikely to significantly benefit from being confined and the benefit would almost exclusively accrue to vulnerable individuals. They are not major spreaders of the virus, and shielding measures should be used to contain the additional risks they would pose within and outside their households.
Adequately protecting and incentivising NHS staff subject to larger risks or burdens	NHS workers are likely to be subject to additional burdens, including additional risk, during periods of increased COVID-19 hospitalization. Fairness requires that risks are minimized through adequate provision of PPE and any significant additional risk is properly compensated when their salaries do not already pay for such additional risks.
Consider the introduction of "immunity passports"	Immunity passports would allow liberty-limiting policies to be applied to a smaller number of people by identifying those who are not at risk. The collective benefit would plausibly outweigh the downsides, such as unequal distribution of liberty restrictions.
Vaccination policies should maximize the collective benefit of the vaccine, but not necessarily prioritize the most vulnerable	Protecting the vulnerable is a priority in vaccine allocation. However, higher need for protection does not necessarily mean stronger claim to access the vaccine first. We need to consider on which groups the vaccine will be more likely to be effective. If indirect protection is more effective, we should opt for that strategy.
Stricter enforcement of behavioural modifications, such as face covering in closed public environments	Face covering is effective at limiting the spread of the virus and entails a very small individual cost. When the individual cost of a measure is very small and the expected benefit is very large, there is a strong ethical case in favour of state coercion.

EXECUTIVE SUMMARY:

The UK "Exit Strategy", which aims at safely easing the restrictions introduced in March 2020 to contain the COVID-19 epidemics in the UK, needs to balance different values and priorities, beyond protecting the population from the virus. The task will be made even more difficult by the fact that the Exit Strategy will have to be responsive to likely new spikes of COVID-19 cases, if not by an actual second wave of the virus. The response to the first wave has been a strict lockdown involving closure of most business activities, schools, and universities; reduction of services (e.g. public transport, postal services, etc); and requirements to remain at home except for basic needs, and to socially distance from other people whenever outside of one's home. Both lockdown and the spread of the virus entail large costs in terms of lives lost, health (both physical and mental), and economic damage (job losses, recession, reductions in households' income). Such costs have been and will likely be unevenly distributed across the population. Containing the virus with very restrictive measures such as lockdowns is only ethically justified if the benefits outweigh the costs and there are no less restrictive alternatives that could plausibly achieve the same results. However, costs and benefits ought to be measured not only in terms of health and death toll of COVID-19, but also in terms of overall impact of such measures on the population's wellbeing. Our ethical analysis is informed by the evidence on the effects of both the COVID-19 pandemic and the response measures adopted so far in the UK and elsewhere. It suggests that while there were strong ethical and public health reasons for imposing it at the beginning of the pandemic, at this moment there are strong ethical and public health reasons to prioritize less restrictive measure. The measures here listed would strike a more reasonable and sustainable balance among the values of health, life, healthcare delivery, fair distribution of burdens and benefits, freedoms and other individual rights, and ultimately wellbeing at the population.

Prioritizing alternatives to lockdown: the ethical and public health justification for lockdown at this stage is very weak. Lockdowns entail a very large economic cost, as well as many other types of costs in terms of mental health, educational gaps, and inequalities. Besides, they are only effective at containing the virus if properly implemented and they are more likely to be effective if implemented very early on in outbreaks. They require adequate level of enforcement by authorities and sense of responsibility by individuals. Thus, in some countries that enforced strict lockdowns during the 'first wave' – including the UK – COVID-19 mortality rates have been higher than in other countries with much milder restrictions. This might partly be explained by late enforcement of lockdown, or other factors leading to a larger or more deadly outbreak. At this point, there are alternatives to lockdown that can strike a better balance among the different values at stake.

Shielding the most vulnerable individuals. Without lockdowns, restrictive measures should be applied only to certain groups that are more likely to suffer severe consequences from COVID-19. These include the elderly and those with certain pre-existing medical conditions. Shielding the most vulnerable is consistent with a

basic ethical principle of least restrictive alternative in public health: under a plausible understanding of this principle, we ought to adopt the policy that can satisfactorily limit the damage of COVID-19 and that is the least infringing upon individual freedoms – including infringing upon the freedoms of the lowest number of people possible. It is not unfair if it the criterion for shielding is need for protection and individual benefit to the shielded.

Implementing effective testing and contact-tracing, if necessary through mandatory use of contact-tracing technology. Contact-tracing is one of the most effective ways of reducing deaths and hospitalizations caused by COVID-19, especially if implemented together with the kinds of interventions we are suggesting here. Technological solutions like contact tracing apps, if properly implemented, are very likely to be effective. They entail some risk of privacy infringements. Privacy is an important value in our society. However, returning to some form of normality where privacy protection can be restored to pre-pandemic level might justifiably require making sacrifices in terms of privacy in the short term.

Quarantining and isolating individuals reasonably presumed to have been exposed to COVID-19. Confining individuals who are more likely to be infectious is another essential measure to contain the spread of the virus that applies the least level of restriction possible at the population level. Such measures should target people who test positive for COVID-19, people who have been tracked through tracing procedures, travellers returning from areas with high infection rates. If quarantine is implemented selectively, there is a strong ethical case to compensate those who are subject to it.

Keeping schools open. Children are among the individuals who have more to lose and less to gain from school closure, since they are extremely unlikely to suffer major consequences of COVID-19 and would pay a high cost in terms of missed of educational opportunities. School closure, after an initial period when it might have been justified, would unfairly burden them. Shielding the vulnerable people whom they might otherwise infect would better protect their interest while reducing the public health impact of their possible exposure to COVID-19.

Better enforcement of face covering requirements. Using face masks is not as culturally accepted in the UK as it is elsewhere, e.g. in Japan. However, it is an effective way of limiting the spread of the virus – actually, the successful management of the pandemic in Japan can be explained also by the traditional widespread use by Japanese people of face masks to prevent spread of diseases. Since the cost to individuals is small and the collective benefit is large, there is a strong ethical case for using state coercion in enforcing face covering requirements.

Better supporting NHS staff exposed to higher risk and to increased working hours. Throughout this pandemic, NHS staff will at times need to take on additional burdens, in terms of increased work load and/or additional risks due to more likely exposure to COVID-19. Providing them with adequate PPE is essential, but fairness requires that any additional risks and workload be properly acknowledged and remunerated, when such risks and burdens are not already reflected in their salaries. The best way to

guarantee fair work arrangements in this situation is to have an incentive scheme for NHS workers who voluntarily take on additional risks or workload.

Immunity passports ought to be considered. Immunity passports would allow immune people to engage in certain activities from which the non-immune are excluded. Once again, this solution would limit the liberties of a smaller number of people than other liberty restricting policies. The collective benefit both in health and economic terms would plausibly outweigh the downsides of immunity passports, such as unequal distribution of liberty restrictions and some privacy infringement. When we have a vaccine that is available to everyone, the ethical case for immunity passport will be stronger because immunity could be acquired in a relatively safe way. Confining everyone when we could safely confine a smaller number of people would be a form of 'levelling down' equality, which is ethically impermissible in this case.

Vaccination policies will need to take into account how effective the vaccine will be on different groups. It is reasonable to say that to maximize the benefits of the future COVID-19 vaccine, we will need to distribute it in a way that protects in the first instance the most vulnerable. However, this does not necessarily mean that the most vulnerable ought to be prioritized in accessing the vaccine, while availability is limited. A lot will depend on how well the vaccine will work on different groups. Vaccine can protect individuals directly or indirectly (through herd immunity), and we will have to figure out which of the two is more likely to protect the vulnerable, given initial limited availability.

THE ETHICAL EXIT STRATEGY:

Ethical guidelines for COVID-19 pandemic management

As part of its COVID-19 pandemic management plan, the UK is now implementing its so called 'Exit Strategy'. This is a series of measures to move the country from the state of lockdown introduced in March 2020 to a 'new normality'. The lockdown consisted of a series of very restrictive measures which included limitations on people's freedom to leave their homes and suspension of most commercial activities, industry, and services. Education was moved to online only.

The Exit Strategy encompasses a plan to not only ease such measures, but also to introduce new ones (e.g. face covering requirements, track-and-trace systems to timely identify and isolate potentially infected individuals, quarantine for those travelling from certain countries into the UK, etc,), as well as to reintroduce some forms of lockdown or other restrictions if deemed necessary to contain new peaks of the virus. As we are going through this process, difficult decisions need to be made almost on a daily basis about whether and how quickly to take new steps.
Future decisions about management of the COVID-19 pandemic in the UK will need to strike a reasonable balance between, on one side, the cost entailed by COVID-19 infections in terms of health and lives lost and burden on the healthcare system and, on the other side, the various costs associated with restrictive measures. These include economic costs, health costs (for instance for diseases like cancer that have been neglected during lockdown) including mental health costs, societal costs (e.g. various forms of inequalities in the distribution of the burdens of the lockdown, or children missing out on proper education).
Although these kinds of decisions are often presented as being informed by science, they are not primarily scientific, medical or economic decisions. They are inevitably and primarily *ethical* decisions. They require making decisions about which values to sacrifice for the sake of which others.

What follows is a list of ethical considerations that we think should inform the Exit Strategy as we face the prospect of a new wave or of local spikes in the next months.

We think the future decisions on the exit strategy need to take the following points into account:

1. **There is no cost-free or risk-free way out of this situation, but costs must be worth the expected benefits.** Public discussion is often shaped as if certain values (health, life, privacy) are not negotiable. This is simply not true. Especially in emergency and facing serious public health threats like this, protecting the collective good in the long term inevitably requires sacrificing something valuable in the short term – including economic growth, privacy, individual freedoms, mental and physical health, and perhaps even some people's lives. The question we should ask is not about which values to sacrifice and which ones to preserve, but about how to strike a reasonable balance among the various types of sacrifices we will inevitably have to make. Limitations of individual rights are justified to the extent that they are proportionate to the expected benefit and that they facilitate the return to a

state of normality where respect of such rights and values is restored to pre-pandemic levels.[1]

2. **We need a balanced approach to the different values at stake**. When lockdown was introduced in March, the primary goal of the UK Government action was to contain the spread of the virus in a way that would allow the NHS to cope with the increase in COVID-19 patients requiring life-saving treatment. This strategy might have been reasonable at the time, especially given the uncertainty around the actual morbidity and mortality of COVID-19. Protecting people from serious diseases is obviously a priority in advanced democracies like the UK. Actually, if anything, there are reasons to think the lockdown should have been implemented much earlier: according to some estimates[2], going into lockdown only 1 week earlier would have halved the death toll. Some countries that enforced lockdowns earlier on, such as Germany, Denmark, and Norway, were more successful at containing the spread of COVID-19 and were therefore able to ease restrictive measures earlier.
   The reason why containing the virus is a priority is that safety and freedom from disease are essential for preserving other basic freedoms, rights, and values. Individual freedom, welfare, mental health, job opportunities all belong to this category. If the lockdown compromises them more than the virus would, then we risk lockdown itself becoming the problem, rather than the solution.
   In normal times, there is only so much a Government can legitimately ask people to sacrifice in order to save lives and promote the public good. The investment in public healthcare in normal times, for instance, is significant, but it is constrained by the need to promote other goals and values of liberal democratic societies. We normally do not save all the lives we could save by investing all the resources in healthcare. Education, support for businesses, public services, are just few examples of the other important things in which we normally invest scarce public resources. An emergency like the COVID-19 pandemic can reasonably require making different trade-offs, but it cannot reasonably require to radically change core principles and values for too long. The success or failure of policies to manage the COVID-19 pandemic should not to be measured only by the number of COVID-19 infections and deaths prevented. It also needs to take into account the complex socio-economic and health implications of lockdowns and alternative responses to the pandemic. Ultimately, public health policies should aim at protecting the general wellbeing of the population. Protecting people from infectious diseases, even serious ones like COVID-19, is only one component of what makes people's lives good enough.

3. **We need to do more research and learn the lessons from the first wave and the lockdown, both in the UK and elsewhere**. Most decisions so far had

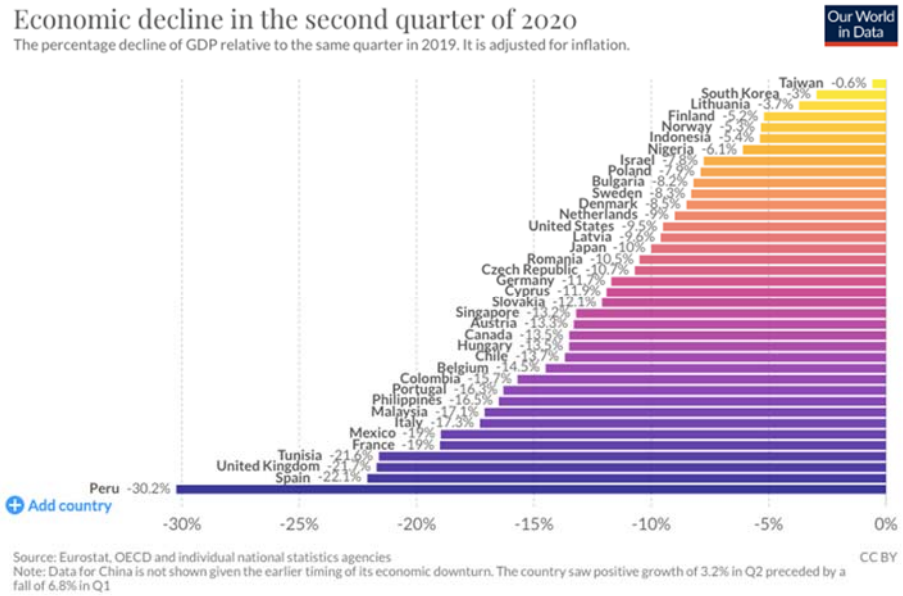
[1] Rainey, S and A. Giubilini, forthcoming. Return to status quo ante: the need for robust and reversible pandemic emergency measures, *Cambridge Quarterly of Healthcare Ethics*
[2] See e.g. former Government scientific adviser Neil Ferguson's interview at https://www.theguardian.com/world/2020/jun/10/uk-coronavirus-lockdown-20000-lives-boris-johnson-neil-ferguson

to be made in conditions of great uncertainty and without the benefit of previous experience.

A pandemic like this is unprecedented in modern times, but the measures many countries implemented were unprecedented as well. We have now seen some of the effects of the lockdown and we know more about the virus. Any future measure will only be justifiable if it is based on a careful analysis of what we now know about the risks of the virus (including in different population groups), and on what outcomes different measures have had in different countries and might reasonably be expected to have in the UK. More rapid research should also be a priority, particularly around the actual mortality of the virus and the rate of transmission, and future decisions will have to be based on the outcomes of such research.

Evidence suggests[3] that it is possible to both protect the economy and contain the virus within manageable levels if appropriate policies are adequately and timely implemented. Such policies need not be lockdowns, although lockdown should be considered as a measure of last resort. If we consider both the economic and health impact of different responses to the pandemic in different countries, we see interesting and potentially useful data. Many countries with stricter lockdowns (such as the UK, Spain, Italy) are much worse off economically than those with softer (e.g. Norway, Germany) or no almost no lockdown (Taiwan, South Korea, Sweden), in terms of difference in GDP growth from the same period in 2019 (see Table 1 below). This is not too surprising. What is perhaps surprising is that many of those in the second groups had better health outcomes. Even Sweden, which has been widely criticised for its lack of lockdown, has so far a lower COVID-19 death rate than the UK (577 vs 611 deaths per million people) as Table 2 below shows. There are a large number of factors that explain such outcomes. Some of these factors are independent of COVID-19 related policies, e.g. demographic distributions, geographical factors, population density. However, other factors include effective implementation of measures such as social distancing, face covering, contact tracing, better protection of residents in care homes.

[3] Hasell, Joe 2020, Which countries have protected both health and the economy in the pandemic? *Our World in Data*, 1 Sept 2020, at https://ourworldindata.org/covid-health-economy%23licence



(Table 1)

Take Sweden, for instance. Sweden largely imposed voluntary measures to implement social distancing (rather than a strict 'lockdown'). Swedish authorities only introduced mild restrictive measures – e.g. banning of gathering of over 50 people – while attempting to keep society and the economy running as usual. Sweden now has a level of immunity much lower than predicted – 15% in August instead of the expected 40% by May, according to one estimate[4]. This has widely been interpreted to mean that the Swedish experiment "failed"[5]. However, while it is true that Sweden failed to achieve herd immunity, achieving herd immunity was not apparently the declared aim of their strategy[6]. Rather, Sweden aimed at striking a balance between the likely cost of COVID-19 spread and the costs of lockdown, implementing measures that could economically and psychologically be sustained for a longer period of time. As a consequence, Sweden has not experienced as heavy an economic impact as some other countries with strict lockdowns, as per Table 1. Because we do not know yet how susceptible Sweden will be to subsequent waves of infection and how great the total economic impact will be, it is at least premature to mark the Swedish Model as a failure.

Importantly, around half of the deaths in Sweden occurred in care homes. The large number of deaths in Sweden in the first three months of the pandemic is mainly due to the fact that the strategy of protecting people in care homes failed. This is a problem that many countries, including the UK, had to face.

[4] Orlowski, E. J. W., & Goldsmith, D. J. A. (2020). Four months into the COVID-19 pandemic, Sweden's prized herd immunity is nowhere in sight. *Journal of the Royal Society of Medicine*, *113*(8), 292–298 at https://journals.sagepub.com/doi/10.1177/0141076820945282

[5] E.g. Steven Reinberg, Sweden's COVID policy didn't create herd immunity, *WebMD,* 13 August 2020 at https://www.webmd.com/lung/news/20200813/swedens-no-lockdown-policy-didnt-achieve-herd-immunity

[6] See *BBC,* Did Sweden's coronavirus strategy succeed or fail? 24 July 2020 at https://www.bbc.co.uk/news/world-europe-53498133

This indicates that the impact of COVID-19 could be significantly reduced by shielding people in care homes without having to restrict liberties of the wider population. This was a successful strategy for other countries, such as Norway, which implemented protections early on. Norway had its own lockdown, which was milder than the UK one[7] (for instance, bars and restaurants that could guarantee 1 metre distance between customers were allowed to remain open), but had significantly better health outcomes than most European countries (48 deaths per million people, as per Table 2). Many factors could explain this success, including policy-independent factors such as population density and rates of travel. But it is worth noticing that, alongside early lockdown and shielding of vulnerable people, testing and tracing was implemented very early on, including testing all returning travellers and tracking down all the contacts of those who tested positive. Germany's success at containing the pandemic with slightly milder measures than the UK's is largely explained not only by a ban on visits in care homes and an earlier lockdown, but also by the very efficient testing and contact-tracing system put in place early on, [8], as well as very localised lockdowns to keep new spikes under control. The German Health Minister recently declared that with today's knowledge of the virus, the lockdown would have been much less drastic and that face covering and social distance are the 'best weapons' against the spread of COVID-19, once we consider all the costs involved[9].
South Korea did not enforce any proper lockdown but still managed to navigate the pandemic very successfully both in terms of health and wealth outcomes. South Korea had 6.30 COVID-19 deaths per million people (the UK's rate is 611 to date) and -3% GDP growth compared to the second quarter of 2019 (the UK had -21.7%)[10] . What made a difference in that case was a very strict enforcement of—and therefore very high compliance with—other measures, most notably contact tracing. The South Korean Government even issued electronic wristbands to those who broke their quarantine (though only with the person's consent)[11]. The decision was made that, given the emergency situation, privacy could be sacrificed to a significant degree for the sake of returning to some form of normality quickly and of preserving both health and the economy. As a result, citizens have been able to enjoy much more freedom than elsewhere.
Japan is another country that managed to successfully contain the pandemic and mitigate its economic impact through much milder measures than lockdown. In particular, it acted by strengthening border control, implementing effective contact tracing that facilitated detection of early clusters, closing schools, and, importantly, prohibiting large gatherings where

[7] Norway Says No to International Travellers as Emergency Coronavirus Measures Start, *Forbes*, 12 March 2020, at https://www.forbes.com/sites/davidnikel/2020/03/12/norway-says-no-to-international-travelers-as-emergency-coronavirus-measures-start/%234f291d58b34d

[8] Germany excels among its European peers, *The Economist*, 25 Apr 2020, at https://www.economist.com/europe/2020/04/25/germany-excels-among-its-european-peers

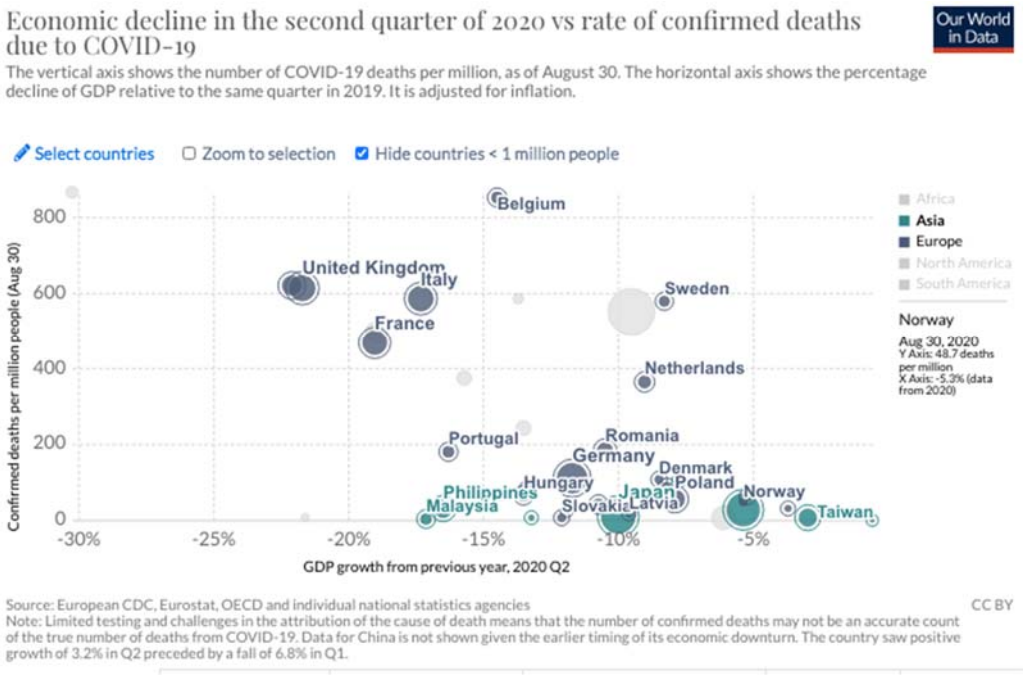
[9] German health minister: we'd do lockdown differently, *Politico*, 2 Sept 2020, at https://www.politico.eu/article/german-health-minister-wed-do-lockdown-differently/

[10] See Hasell, Joe 2020, footnote 2

[11] 'Governments are starting to ease restrictions', *The Economist*, 16 Apr 2020, at https://www.economist.com/international/2020/04/16/governments-are-starting-to-ease-restrictions

the virus could spread fast, such as sport events or festival. Japan never went into lockdown—non-essential businesses were encouraged to suspend operations if possible, but this was never a legal requirements—but it enforced very strictly behavioural modifications, such as more widespread face covering and avoidance of mass gatherings, that turned out to be very effective even in absence of lockdown.[12]

Table 2 here below shows that it is incorrect to frame the management of the pandemic in terms of a "health-wealth tradeoff", since some countries did relatively well in both respects. It also shows that the presence or absence of lockdowns does not correlate with countries' success (or lack thereof) at containing COVID-19. For a quick read, countries at the bottom right corner of the table have better health and economy outcomes than countries at upper left corner; countries on the right part have better economic outcomes than countries on the left; countries in the lower part have better health outcomes than countries in the upper part. As also Table 3 shows, some of the countries that had mild or basically no lockdowns have better health and wealth outcomes than countries with hard restrictions.



(Table 2)

4. **Nationwide lockdown is not necessarily the best and most ethical response to new spikes or to a second wave.** Because lockdown does not correlate with successful health outcomes when infection is already widespread, and it entails its own costs in terms of economy, liberty infringement, and health, it is unlikely to be the most ethical response to the pandemic at this point, all things considered. Table 3 below shows how some of the countries with the highest death rate of COVID-19 are those that implemented stricter lockdowns, such as Belgium, the UK, Italy, Spain, France. Delays in enforcing

[12] Tashiro, A. and R. Shaw 2020. COVID-19 Pandemic Response in Japan: What Is behind the Initial Flattening of the Curve? *Sustainability*, 12, 13: 5250

lockdowns can partly explain why in some countries they have not been as effective as one would have hoped.

Country	confirmed deaths due to COVID-19 per million people deaths per million	GDP growth from previous year, 2020 Q2 percent
Peru	867.62	-30.2%
Belgium	853.35	-14.5%
Spain	620.49	-22.1%
United Kingdom	611.29	-21.7%
Italy	586.70	-17.3%
Chile	584.90	-13.7%
Sweden	577.27	-8.3%
Brazil	566.72	
United States	552.20	-9.5%
Mexico	494.98	-19.0%
France	468.83	-19.0%
Panama	459.58	
Bolivia	423.03	
Colombia	374.66	-15.7%
Ecuador	370.51	
Netherlands	362.71	-9.0%

(Table 3. Source: Our World in Data, last update 8 September 2020)

National lockdown was mostly justified in the first wave of the pandemic by fears that the mortality rate of the virus could be very high and that the NHS could not cope with a high number of hospitalized COVID-19 patients at any one time. Recent estimates suggest that the mortality rate is somewhere between 0.5 and 1%[13], although some epidemiologists consider it to be much lower[14] - WHO's limited data at the beginning of the pandemic in March suggested a mortality rate as high as 5-6%[15]. Moreover, when we break this number down by age groups, there is significant variation. As per Table 4 below, the estimated death rate of COVID-19 is 7.8% in the over 80s and 0.0016% in children younger than 9[16] – for children, this is similar to the fatality rate of chickenpox. It is true that mortality is not the only negative aspect to consider. In particular, there is some uncertainty around some long term effect of COVID-19 on some people, including fatigue, racing heartbeat, shortness of breath, achy joints, foggy thinking, a persistent loss of sense of smell, and damage to the heart, lungs, kidneys, and brain[17]. It appears that

[13] *Nature News*, 16 June 2020, How deadly is coronavirus? Scientists are close to an answer, at https://www.nature.com/articles/d41586-020-01738-2

[14] Sunetra Gupta's estimate, for instance, is somewhere between 0.1% and 0.01%, see *UnHerd*, 21 May 2020 , Sunetra Gupta: Covid-19 is on the way out., read interview at https://unherd.com/2020/05/oxford-doubles-down-sunetra-gupta-interview/ (last access 22 August 2020)

[15] Baud et al 2020, Real estimates of mortality following COVID-19 infection, *Lancet Infectious Disease*, 20, 7: P773

[16] Verity R, Okell LC, Dorigatti I, et al. Estimates of the severity of coronavirus disease 2019: a model-based analysis. *Lancet Infect Dis* 2020 Mar 30; Mahase Elisabeth. Covid-19: death rate is 0.66% and increases with age, study estimates *BMJ* 2020; 369 :m1327

[17] Carfì A, Bernabei R, Landi F, for the Gemelli Against COVID-19 Post-Acute Care Study Group. Persistent Symptoms in Patients After Acute COVID-19. *JAMA*. 2020;324(6):603–605 at https://jamanetwork.com/journals/jama/fullarticle/2768351. Couzin-Frankel, L, 2020. From 'brain fog' to heart damage, COVID-19's lingering problems alarm scientists**,** *ScienceMag***,** 31 Jul 2020 at

these symptoms and consequences are more frequent in the more severe cases, which tend to occur in the elderly[18], whom would indeed need to be protected even in absence of lockdown (e.g. through shielding measures; see point 6 below). For instance, 20%–30% of hospitalized patients hospitalized have evidence of myocardial involvement.[19]

In milder cases not requiring hospitalization, which are the vast majority, symptoms appear to last for longer than 4 weeks in 1 out of 10 people.[20] It is of course important to constantly monitor and study the long term consequences of COVID-19 in patients who recover – as is being done for example through the *Post-Hospitalization COVID-19*[21] study in the UK – and modify future policies accordingly, for example if it turns out that the long term effects of COVID-19 are significantly more frequent or more severe than currently thought. Again, it is a matter of balancing these risks against the harms and the effectiveness of the various measures implemented to reduce them. And again, lockdown is not necessarily the best and most ethical solution.

	Deaths	Laboratory-confirmed cases*	Case fatality ratio			Infection fatality ratio†
			Crude	Adjusted for censoring	Adjusted for censoring, demography, and under-ascertainment‡	
Overall	1023	44 672	2·29% (2·15–2·43)	3·67% (3·56–3·80)	1·38% (1·23–1·53)	0·657% (0·389–1·33)
Age group, years						
0–9	0	416	0·000% (0·000–0·883)	0·0954% (0·0110–1·34)	0·00260% (0·000312–0·0382)	0·00161% (0·000185–0·0249)
10–19	1	549	0·182% (0·00461–1·01)	0·352% (0·0663–1·74)	0·0148% (0·00288–0·0759)	0·00695% (0·00149–0·0502)
20–29	7	3619	0·193% (0·0778–0·398)	0·296% (0·158–0·662)	0·0600% (0·0317–0·132)	0·0309% (0·0138–0·0923)
30–39	18	7600	0·237% (0·140–0·374)	0·348% (0·241–0·577)	0·146% (0·103–0·255)	0·0844% (0·0408–0·185)
40–49	38	8571	0·443% (0·314–0·608)	0·711% (0·521–0·966)	0·295% (0·221–0·422)	0·161% (0·0764–0·323)
50–59	130	10 008	1·30% (1·09–1·54)	2·06% (1·74–2·43)	1·25% (1·03–1·55)	0·595% (0·344–1·28)
60–69	309	8583	3·60% (3·22–4·02)	5·79% (5·20–6·34)	3·99% (3·41–4·55)	1·93% (1·11–3·89)
70–79	312	3918	7·96% (7·13–8·86)	12·7% (11·5–13·9)	8·61% (7·48–9·99)	4·28% (2·45–8·44)
≥80	208	1408	14·8% (13·0–16·7)	23·3% (20·3–26·7)	13·4% (11·2–15·9)	7·80% (3·80–13·3)
Age category (binary), years						
<60	194	30 763	0·631% (0·545–0·726)	1·01% (0·900–1·17)	0·318% (0·274–0·378)	0·145% (0·0883–0·317)
≥60	829	13 909	5·96% (5·57–6·37)	9·49% (9·11–9·95)	6·38% (5·70–7·17)	3·28% (1·82–6·18)

Crude case fatality ratios are presented as mean (95% confidence interval). All other fatality ratios are presented as posterior mode (95% credible interval). Estimates are shown to three significant figures. Cases and deaths are aggregate numbers reported from Jan 1 to Feb 11, 2020.† Crude case fatality ratios are calculated as the number of deaths divided by the number of laboratory-confirmed cases. Our estimates also include clinically diagnosed cases (a scaling of 1·31 applied across all age-groups, as the breakdown by age was not reported for clinically diagnosed cases), which gives larger denominators and thus lower case fatality ratios than if only laboratory-confirmed cases were included. *Values do not include the clinically diagnosed cases included in our estimates. †Obtained by combining estimates of case fatality ratios with information on infection prevalence obtained from those returning home on repatriation flights. ‡Accounts for the underlying demography in Wuhan and elsewhere in China and corrects for under-ascertainment.

Table 1: Estimates of case fatality ratio and infection fatality ratio obtained from aggregate time series of cases in mainland China

(Table 4. Source: Verity R, Okell LC, Dorigatti I, et al. Estimates of the severity of coronavirus disease 2019: a model-based analysis. Lancet Infect

https://www.sciencemag.org/news/2020/07/brain-fog-heart-damage-covid-19-s-lingering-problems-alarm-scientists (last access 26 September)

[18] Servick, K 2020. For survivors of severe COVID-19, beating the virus is just the beginning, 8 Apr 2020, at https://www.sciencemag.org/news/2020/04/survivors-severe-covid-19-beating-virus-just-beginning (access 26 Sept 2020)

[19] Mitrani et al 2020, COVID-19 cardiac injury: implications for long-term surveillance and outcomes in survivors. Heart Rhythm, *in press*, Online First 26 June

[20] Public Health England 2020. COVID-19: long term health effects, at https://www.gov.uk/government/publications/covid-19-long-term-health-effects/covid-19-long-term-health-effects (last access 26 Sept 2020)

[21] PHOSP-COVID, at https://www.phosp.org/ (last access 26 Sept 2020)

Dis 2020 Mar 30; Mahase Elisabeth. Covid-19: death rate is 0.66% and increases with age, study estimates BMJ 2020; 369 :m1327)

Enforcing a lockdown across the whole population potentially disregards the different burdens of the virus on different groups and, in the long term, risks unfairly burdening some segments of the population. While a small minority of people are at a high risk from COVID-19, the majority of people are at significant risk of paying some of the very large costs of the lockdown.

For instance, the UK is now officially in the deepest recession since records began. Almost everyone is going to pay the cost of it. As of 22 September, more than 200,000 people have been made redundant in the UK[22], and more than 9.6 million are on the furlough scheme. This economic impact is likely to entail a big toll in terms of health, including mental health. Recessions historically have a huge impact on people's health outcomes both in the short and long term and also on mortality[23], including deterioration of mental health and increase in suicidal behaviours[24]. Clearly, not all of this cost is attributable to the lockdown itself. Counterfactuals are difficult to pin down: we do not know how different policies, e.g. the Swedish Model, would have worked in the UK. People's behavioural changes due to the spread of the virus in the absence of strong governmental intervention would also have an economic impact, whose magnitude is uncertain. Lockdown ought to be considered if its benefits can plausibly be taken to outweigh the costs in these possible alternative scenarios, and a second lockdown might work better than the first one. But these figures do suggest that its costs might be very high and its potential benefit very uncertain, so the justification for a new lockdown might be quite difficult to produce.

Importantly, the lockdown has entailed significant health costs quite independently of those likely to result from recession. For instance, it has been estimated that more than 24,000 cases of various types of cancer have gone undiagnosed during the lockdown in the UK, and delays in treatment have meant that some people's disease is now inoperable. It has been estimated that for every week in which screening has been paused during lockdown, 7,000 people have not been referred for further test and 380 cancers have not been diagnosed[25]. It is not clear that the health cost of COVID-19 will in the long run be larger than the health cost of lockdown.

Taking mental health into account, the costs of lockdown are even greater. According to the Office of National Statistics, during the pandemic the number of people suffering from depression in the UK has doubled, reaching

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[22] The Guardian, *UK Coronavirus job losses: the latest data on redundancies and furlough,* at https://www.theguardian.com/world/2020/jul/31/uk-coronavirus-job-losses-the-latest-data-on-redundancies-and-furloughs (last access 26 Sept 2020)

[23] Banks, J., Karjalainen, H. and Propper, C. (2020), Recessions and Health: The Long-Term Health Consequences of Responses to the Coronavirus*. Fiscal Studies, 41: 337-344.

[24] Frasquilho, D., Matos, M., Salonna, F. *et al.* Mental health outcomes in times of economic recession: a systematic literature review. *BMC Public Health* **16,** 115 (2015) at https://doi.org/10.1186/s12889-016-2720-y

[25] Cancer Research UK 2020, *Over 2 million people waiting for cancer screening, tests and treatments*, at https://scienceblog.cancerresearchuk.org/2020/06/01/impact-of-coronavirus-on-cancer-services-revealed-over-2-million-people-waiting-for-screening-tests-and-treatments/

20% in June. While there are different possible explanations for this (including, e.g. anxiety caused by the possibility of getting infected), it is telling that according to the ONS "[o]f those experiencing moderate to severe depressive symptoms during the pandemic, 61.7% reported that they felt lonely "often or always"."[26] A recent survey by the mental health charity *Mind* found that 65% adults with pre-existing mental health problems reported a worsening of their condition, with a peak of 75% in the 13-24 age group, and 22% of participants reported poor or very poor mental health despite lack of pre-existing mental health problems. Also in this case, the problem has been exacerbated by lack of contact with mental health services[27]. There is a concern among psychiatrists that the lockdown will increase suicide risk if adequate and timely steps to prevent it are not taken[28] (Gunnell et al 2020). Besides, lockdown raises ethical issues not only about its costs, but also about unfairness in the distribution of such costs. For example, a lot of the debate around the effects of COVID-19 so far has highlighted that some ethnic groups have been disproportionately affected by the virus. However, it is also the case that certain demographic groups have been affected by the lockdown more negatively than others. Women and people without university degrees, i.e. those more likely to come from disadvantaged socio-economic backgrounds, are more likely to lose their jobs or have loss of income[29], partly because they make up about 75% of part-time workers. According to the *Guardian's* database tracking job losses, BAME people are also overrepresented in sectors with higher rates of furloughed jobs and redundancies[30]. In the medium-long term, some of these costs will translate into public health costs that could be larger than the equivalent costs of the virus. It is important to assess to what extent these costs and inequalities are attributable to the lockdown itself, of course, and this is something for which we do not have direct evidence – hence the importance of carrying out further research on the costs of lockdown, as per point 3 above. But the fact that countries with milder measures had much better economic outcomes is a strong indicator that large part of such costs are due to lockdown itself.
The relevant question is about what cost it is legitimate to impose on the majority of the population in order to protect the small minority that is likely to suffer serious consequences from COVID-19. While it is reasonable to require the majority to make certain sacrifices for the sake of the minority, the sacrifices involved in lockdown are significant.

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[26] ONS, Coronavirus and depression in adults, Great Britain: June 2020. At https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/coronavirusanddepressioninadultsgreatbritain/june2020 (last access 18 Aug 2020)

[27] Mind, The Mental Health Emergency, June 2020, at https://www.mind.org.uk/media-a/5929/the-mental-health-emergency_a4_final.pdf

[28] Gunnell et al 2020, Suicide risk and prevention during the Covid-19 pandemic, *The Lancet Psychiatry*, 7, 6: 468-471

[29] Adams-Prassl, Boneva, Golin, Rauh 2020a. *Inequality in the Impact of the Coronavirus Shock: Evidence from Real Time Surveys , unpublished;* Adams-Prassl, *Boneva, Golin, Rauh* 2020b Work Tasks That Can Be Done From Home: Evidence on the Variation Within and Across Occupations and Industries, *unpublished.* See reports of these work at https://www.cam.ac.uk/research/news/women-bear-brunt-of-coronavirus-economic-shutdown-in-uk-and-us

[30] See *the Guardian*'s updates at https://www.theguardian.com/world/2020/jul/31/uk-coronavirus-job-losses-the-latest-data-on-redundancies-and-furloughs

5. **The risks and costs of the lockdown and alternative strategies need to be investigated and publicly acknowledged.** The Government should be as open and transparent as possible about the risks of the virus, the costs of the lockdown so far and the estimated costs of any future lockdown, as well alternative strategies. In a democracy, the public need to know the reasons for government decisions and the evidence governments base them on. We saw above that it is very difficult to assess precisely how much of the costs we have described are attributable to the lockdown itself. But more should be done to study this. In a democratic society that needs to strike a reasonable balance between the cost of restrictive measures and the cost of the virus itself, this is as important as updating citizens about the death toll and infection rate of COVID-19. Many have been asked to make big sacrifices mainly to protect a small number people, more vulnerable to the virus (mainly the elderly and those with pre-existing conditions). Democratic societies should ensure that those who are required to make sacrifices are provided with solid justification for them, which at the very least requires that they are informed about the kind of burdens they are subjected to and the burdens that are likely to result. Again, while we did not have enough evidence to provide this information at the beginning of the lockdown in March, we have a clearer idea now of what a prolonged lockdown entails. *If* a second lockdown is at some point necessary, there should be a very solid factual basis to support it.

6. **Selective shielding of vulnerable groups is arguably ethically preferable to widescale lockdown.** Lockdown during the first wave has imposed liberty restrictions at the population level, with exceptions allowed not on the basis of risks related to COVID-19, but on the basis of whether certain activities were deemed 'essential'. Given the huge costs of such measures illustrated above, we should consider reversing this approach: society would remain 'open' and individual freedoms preserved (unless liberty infringements pose small costs on individuals, e.g. in the case of wearing face covering), *with the exception of certain groups*. Shielding should be offered (and supported) or, if necessary, enforced, on the basis of the risk profile of certain groups and considerations of the individual benefits of shielding for the members of these groups. For certain groups in particular the benefits of confinement would arguably outweigh the benefits of preserving freedom. The cost/benefit assessment will inevitably require careful assessment on a case by case (individual by individual or group by group) basis.
   Less restrictive measures ought to be preferred when these are sufficient to preserve an important public good – such as protection against the harms of infectious diseases – to a satisfactory level. This approach is consistent with a principle of 'least restrictive alternative' in public health, which is widely recognized as a pillar of public health ethics and policy. A plausible interpretation of the principle in the context of the COVID-19 pandemic is that we should limit individual freedoms to the lowest degree possible and for the smallest number of people possible that would allow to contain the spread of the virus while keeping society and the economy functioning. Shielding the vulnerable would protect them by preserving other groups' freedom to a significant extent, and is therefore in an important sense less restrictive than a population-wide lockdown. It would be an unequal treatment of different

groups, but it would not be a form unethical discrimination. Since risk profile is an ethically relevant consideration in this case, the unequal treatment would not be unfair because it would not be based on arbitrary, irrelevant factors. There should be enhanced social support for those who are shielded. Examples include financial support to enable others in the household to work from home, free home deliveries, and private education access for children unable to return to school.

If we are concerned about minimizing the overall risks, the relevant consideration is the threshold of risks related to COVID-19 after which shielding becomes in a person's self interest and in the collective interest. From an ethical point, the problem is not inequality but risk minimization, both for individuals and the collective. Some groups have higher *relative* risk. That is a consideration about *unequal* risk distribution. For example, men and people from certain BAME[31] backgrounds are considered at a significantly higher risk of severe consequences and dying of COVID-19[32]. But whether individuals should be shielded should depend on the *absolute* risk, not on the relative risk, because it is the absolute risk that determines whether shielding is in someone's best interest. This is a consideration about risk threshold. Those from BAME backgrounds are thought to be at higher risk than those from white ethnic groups. There is a lot of uncertainty around the actual mortality rate in different ethnic groups – one study for example found that "non-white ethic groups have the same or significantly better survival than the white ethnic group"[33]. But the risk would need to be quite substantial to make shielding of certain ethnic groups something in their best interest.

There are 2 reasons against shielding on the basis of ethnicity. First, unless mortality rate in any of these groups is very high, members of these groups are unlikely to benefit individually from shielding, which, if anything, might exacerbate current socio-economic inequalities. Second, what is more likely to account for the higher mortality rate is not ethnicity per se, but factors that correlate with ethnicity such as types of occupation and socio-economic deprivation[34] – which have been shown to increase risk of COVID-19 infection[35]. Members of these groups – as well as those of other groups who face the same socio-economic disadvantages - are better protected by

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[31] Aldridge RW, Lewer D, Katikireddi SV *et al.* Black, Asian and Minority Ethnic groups in England are at increased risk of death from COVID-19: indirect standardisation of NHS mortality data [version 2; peer review: 3 approved]. *Wellcome Open Res* 2020, **5**:88

[32] Public Health England 2020, *Disparities in the risks and outcomes of COVID-19*, August 2020 Update, at, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/908434/Disparities_in_the_risk_and_outcomes_of_COVID_August_2020_update.pdf

[33] Harrison et al 2020, Investigating associations between ethnicity and outcome from COVID-19 Rapid report from CO-CIN for SAGE 14th April 2020, at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886428/s0131-co-cin-report-ethnicity-outcomes-140420-sage25.pdf

[34] Harrison et al 2020, , Investigating associations between ethnicity and outcome from COVID-19 Rapid report from CO-CIN for SAGE 14th April 2020, at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886428/s0131-co-cin-report-ethnicity-outcomes-140420-sage25.pdf

[35] Public Health England 2020, *Disparities in the risks and outcomes of COVID-19*, August 2020 Update, at, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/908434/Disparities_in_the_risk_and_outcomes_of_COVID_August_2020_update.pdf

addressing such socio-economic aspects. This does not imply that the increased risk is negligible or should be ignored: on the contrary, it is important to understand and address it. But it is unlikely that shielding will be the most appropriate measure to do that.
On the other hand, COVID-19 fatality rate for over 80s is estimated to be quite high, almost 8%[36]. Old age and certain pre-existing conditions (such as cancer, certain severe lung problems, immunocompromised state (e.g. resulting from cancer therapies or organ transplants))[37] are the most significant risk factors that justify shielding of groups with these characteristics for their own sake. Shielding should be applied to these groups at risk, where the threshold of risk means that the individual benefits to shielders outweigh the individual costs to them of shielding.

7. **Contact tracing and testing ought to be scaled up, tracing apps more widely used, and quarantine and isolation strictly implemented.** There is strong evidence in favour of the effectiveness of contact tracing, both from scientific work[38] and from the experience of countries like South Korea, Norway, and Germany.[39]
If necessary to guarantee the level of compliance required to control the virus, contact tracing, including through mobile apps, should be made mandatory in some form – for example, a requirement for accessing certain public spaces. The NHS contact tracing app the UK has just implemented is promising – although not without shortcomings (i.e. it does not work on certain phones,). These would ideally need to be fixed in a timely manner in order to make the app available for, and useful to, the largest number of people possible.
If a person tests positive for COVID-19, they 'inform' the app on their phone by entering the test code (if they have one), which in turns sends the information to other mobile phones which have been in proximity with it. People would thus be aware of having been exposed to the virus and could self-isolate. From an ethical point of view, the risk of significant privacy infringement is very small or even non-existent. Data collected would only be used for the purpose of tracing potentially infected people during the pandemic in order to prevent them infecting others, and for understanding the way the virus spreads. People are only asked to enter the first 3 digit of their postcode in the app, they can delete data any time and in any case data about people's movements are deleted automatically after 21 days. No names or addresses would be recorded. Privacy would not be violated in a way that could plausibly harm individuals, and any intrinsic value that privacy might have would be outweighed by the importance of containing the virus and

[36] Verity et al 2020, Estimates of the severity of coronavirus disease 2019: a model based analysis. *The Lancet Infectious Disease*, 20, 669-77.
[37] NHS, Who's at higher risk from coronavirus, at https://www.nhs.uk/conditions/coronavirus-covid-19/people-at-higher-risk/whos-at-higher-risk-from-coronavirus/ (last access 20 Sept 2020)
[38] Abueg et al, Modeling the combined effect of digital exposure notification and non-pharmaceutical interventions on the COVID-19 epidemic in Washington state, under review, available at https://www.medrxiv.org/content/10.1101/2020.08.29.20184135v1.full.pdf Ferretti et al Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing, *Science*, 38, 6491, eabb6936
[39] White L, van Basshuysen P. How to overcome lockdown: selective isolation versus contact tracing *Journal of Medical Ethics* Published Online First: 19 August 2020

preventing serious risks for other people. Thus, since the individual cost of using the app is very small and the expected collective benefit very large, some form of mandatory use of the app (for instance in order to access certain public spaces) should be considered if deemed necessary to ensure that the public health benefit of the app is maximized.
It seems reasonable that people who are or can reasonably be presumed to be infectious (e.g. those returning from areas with high COVID-19 infection rates) should be required to quarantine. Quarantine is a measure that does not benefit, and can actually harm, those who are subject to it, but that can significantly benefit other people and the collective in general by preventing contagion. Because the individual cost is very large and the collective benefit is very significant, there are ethical considerations of fairness and reciprocity in favour of compensating those who are subject to quarantine measures.[40]

8. **Behavioural modification, such as face covering, needs to be adequately enforced.** Face covering has been the subject of much controversy in the last months regarding its effectiveness at preventing contagion and protecting those who adopts this measure. The scientific consensus is now that they are effective at preventing transmissions[41]. Given that the cost of wearing face coverings is extremely low (with the exception of the very rare cases in which there are medical contraindications to their use), and their benefit at the collective level are potentially very large, there should be stricter enforcement of face covering requirements at least in closed environments where people are more likely to be in close proximity with each other (e.g. shops, supermarkets, public transport, offices). The cultural acceptance of face covering by Japanese people is considered to be a central aspect of Japan's successful management of the pandemic so far.[42]
The costs of such measures are smaller than the costs of stricter measures (including lockdown), to the extent that these are temporary measures aimed at restoring freedoms and other individual rights to pre-pandemic levels. Since there is no cost-free way through and out of this pandemic, we need to take on the smallest cost possible that would allow to satisfactorily contain the virus. There is a strong ethical case for applying large penalties for non-compliance with public health requirements that have very small individual costs but very large collective benefits[43]

9. **Immunity passports ought to be considered**. If appropriately implemented, immunity passports could drastically minimize the impact of restrictive measures by allowing individuals who have gained immunity against COVID-19, and are therefore unlikely to spread the virus, to continue to lead a normal

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[40] Giubilini, A. and J Savulescu 2019. Demandingness and public health ethics, *Moral Philosophy and Politics*, 6, 1: 65-87

[41] The Royal Society and British Academy 2020, *Face masks and coverings for the general public: Behavioural knowledge, effectiveness of cloth coverings and public messaging*', at https://royalsociety.org/-/media/policy/projects/set-c/set-c-facemasks.pdf?la=en-GB&hash=A22A87CB28F7D6AD9BD93BBCBFC2BB24

[42] Tashiro, A. and R. Shaw 2020. COVID-19 Pandemic Response in Japan: What Is behind the Initial Flattening of the Curve? Sustainability, 12, 13: 5250

[43] Giubilini, A. and J Savulescu 2019. Demandingness and public health ethics, *Moral Philosophy and Politics*, 6, 1: 65-87

life. This could have an enormous benefit at the population level in terms of economic impact, preserving the highest degree possible of freedom, successfully containing the virus, and keeping individuals safe. Absent a vaccine, the use of immunity passports is the measure more likely to guarantee successful pandemic management along all those dimensions. As we learn more about the virus and the immunological response to it, there is mounting evidence in support of immunity conferred by COVID-19 infection. Antibody responses remain elevated above pre-infection levels over at least 4 months – but it is reasonable to assume it would be longer, as we simply could not observe immunological responses for longer than 4 months so far[44]. Higher antibody levels in ill patients were associated with lower viral loads[45]. Given how beneficial immunity passports could be for the collective, there is an ethical imperative to research in depth the immunological response to COVID-19, including its duration. If the scientific evidence for long lasting immunity after infection is strong enough, immunity passports ought to be considered.

The case for immunity passports will be even stronger once we have a vaccine, which would provide an even higher degree of confidence regarding duration of immunity. Vaccination-based immunity passports would undermine the worry that immunity passports would create a perverse incentive to seek infection - although a recent survey suggests that people are not keen on voluntarily seeking infection[46]. While some worry that immunity passports would exacerbate discrimination and stigmatization towards groups that are already disadvantaged and are more at risk of contracting COVID-19, these claims are rather speculative. In any case, any social or economic disparity that might result in worst health outcomes for certain groups should be taken as a reason to address the sources of such disparities, rather than as a reason to hinder health measures that could vastly benefit the collective[47] – especially if we consider that controlling the pandemic effectively would especially benefit those groups that are most heavily affected by it.

10. **The case for closing schools and keeping children in lockdown is very weak.** One thing we know now, which we did not when the pandemic started, is that the risk of COVID-19 for school age children appears to be very low – children younger than 16 accounted for slightly more than 1% of all recorded

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[44] Crawford, K.H., et al., Dynamics of neutralizing antibody titers in the months after SARS- CoV-2 infection. *medRxiv*, 2020; Iyer, A.S., et al., Dynamics and significance of the antibody response to SARS-CoV-2 infection. *MedRxiv*, 2020; Wajnberg, A., et al., SARS-CoV-2 infection induces robust, neutralizing antibody responses that are stable for at least three months. *medRxiv*, 2020. Gudbjartsson, D.F., et al., Humoral Immune Response to SARS-CoV-2 in Iceland. *New England Journal of Medicine,* 2020.

[45] Bryan, A., et al., Anti-SARS-CoV-2 IgG antibodies are associated with reduced viral load. *medRxiv*, 2020.

[46] Simon Dennis, Y.K., et al. 2020. *Survey on Immunity Passports: United Kingdom Wave 2* on 16 April 2020. 2020 [cited 2020 27/04/2020]; Available from: https://stephanlewandowsky.github.io/UKsocialLicence/UKCovWave2.html%235_immunity_passports

[47] Brown et al. forthcoming. The scientific and ethical feasibility of immunity passports, *Lancet Infectious Disease*. Brown RCH, Savulescu J, Williams B, *et al,*, 2020, Passport to freedom? Immunity passports for COVID-19, *Journal of Medical Ethics* Published Online First: 15 August 2020 at https://jme.bmj.com/content/46/10/652

COVID-19 cases in the UK during the first wave[48]. We also know that the majority of children are asymptomatic –one study has estimated that clinical symptoms manifest in 21% of infections in 10- to 19-year-olds [49]. It is clear that children and teenagers are among the groups who have the least to gain from lockdown. Keeping children away from schools for a prolonged time has entailed a large cost for children and their families, in terms of education gaps, inequalities, isolation of children, additional burdens and responsibilities for families and primary carers, including inability to work. The main reason for closing schools would be to protect vulnerable groups and staff working in schools. However, evidence suggests that children are not big spreader of COVID-19[50]. In Sweden, with schools being kept open for the under-16s throughout the pandemic, infection rates among children have not been higher than in neighbouring country like Finland, which closed schools, and infection rates in teachers have not being higher than among other occupational groups[51]. While children do inevitably pose some risks for school staff and vulnerable individuals in their households or families, such risks could and ought to be managed in a way that limits to the greatest extent possible any further cost on children, including the aforementioned shielding measures.

11. **Protecting the NHS and adequately incentivising and rewarding NHS staff taking on additional risks.** Alternatives to lockdown might imply a higher number of patients needing hospitalization and medical resources (respirators, ICU beds, etc) – although a higher level of immunity at the population level might counteract this trend in the long term. More infections mean an increased burden on the NHS and on NHS staff. So far, the NHS managed to cope with the emergency also thanks to the extra work and sacrifices of NHS staff, including their exposure to additional risks. The case of the largely unutilized Nightingale Hospital, quickly set up outside of London specifically to deal with COVID-19 patients, suggests that the NHS has the capacity to absorb more patients than the number of patients presenting in the first wave. But the NHS as a system is only one aspect of the problem. NHS staff needs to be better supported and protected - lack of Personal Protective Equipment (PPE) for NHS workers was one of the most despicable aspects of pandemic management during the first wave. The additional risks and burden they bear need to be rewarded beyond the

[48] Ladhani SN, Amin-Chowdhury Z, Davies H, *et al* COVID-19 in children: analysis of the first pandemic peak in England *Archives of Disease in Childhood* Published Online First: 12 August 2020. at https://adc.bmj.com/content/archdischild/early/2020/07/28/archdischild-2020-320042.full.pdf. See also: Coronavirus: Children made up just 1% of COVID-19 cases in England in first peak – study , *Sky News*, 13 Aug 2020, at https://news.sky.com/story/coronavirus-children-made-up-just-1-of-covid-19-cases-in-england-in-first-peak-study-12047835

[49] Davies, N.G., Klepac, P., Liu, Y. *et al.* Age-dependent effects in the transmission and control of COVID-19 epidemics. *Nat Med* **26,** 1205–1211 (2020). https://www.nature.com/articles/s41591-020-0962-9

[50] Ladhani SN, Amin-Chowdhury Z, Davies HG, *et al* COVID-19 in children: analysis of the first pandemic peak in England, *Archives of Disease in Childhood* Published Online First: 12 August 2020; Munro APS, Faust SN 2020, Children are not COVID-19 super spreaders: time to go back to school *Archives of Disease in Childhood* ;105:618-619.

[51] Nordic Study Suggests Open Schools Don't Spread Virus Much, Bloomberg, 20 June 2020 at https://www.bloomberg.com/news/articles/2020-07-19/covid-s-spread-in-schools-is-questioned-in-latest-nordic-study

symbolic, though very meaningful, gestures like clapping at the door every week or displaying rainbows at windows. Additional risks need to be 1) minimized by adequate provision of PPE and 2) recognized and rewarded by adequate compensation or incentives. While taking on extra risks deriving from infectious disease might, to an extent, be part of the professional obligations of at least some healthcare workers, any additional risk or burden which is not reflected in their salaries and working arrangements need to be reflected in their financial compensation during the pandemic. Hence, extra payment is owed to staff that takes on themselves additional burdens resulting from treating COVID-19 patients. Fair treatment of healthcare workers would of course require investing significant resources in the NHS. Setting up an incentive scheme, whereby NHS staff are offered additional benefits for voluntarily taking up more risky or burdensome tasks during the pandemic, could strike a reasonable balance between freedom to take on oneself additional risks and burdens, effective healthcare delivery, and fair working conditions.

12. **Prioritization in accessing the vaccine will have to take into account how effective the vaccine will be on different groups.** When we have a vaccine, we want to maximize its benefits given likely initial limited availability, taking into account some basic fairness requirements. Maximizing the benefits means, plausibly, preventing as many COVID-19 deaths as possible. Prioritizing healthcare workers is part of a strategy to maximize the benefits of the vaccines, because it would guarantee safe healthcare delivery. It also responds to a reciprocity requirement: because they could be exposed to higher risks while carrying out their essential duties, healthcare workers should be offered increased protection. Other population groups should be prioritized in a way that would offer the greatest protection possible to the more vulnerable. This *might* mean prioritizing the vulnerable groups themselves, but not necessarily so. A lot depends on which groups the vaccine will be more effective on. For example, if, as is the case with the flu vaccine, the COVID-19 vaccine will turn out to be more effective on young people than on the elderly, this would constitute a reason to prioritize the young in accessing the vaccine This would maximize the chances that the elderly will be protected, through indirect immunity and ideally through herd immunity. While it is too early to tell whether this will be the best strategy, it is important at this stage not to simply assume that the most vulnerable groups should have priority access. From an ethical point of, view, vaccinating a group that needs the vaccine the least to protect a group that needs protection the most would mean using the first group mostly as a means to protect the latter. However, whether this is ethically permissible, and in what form (e.g. through mandatory or voluntary vaccination policies), depends on factors which at the moment are unknown, such as the risk profile of the vaccine and its effectiveness on different groups. [52]

[52] Alberto Giubilini, Julian Savulescu, Dominic Wilkinson, COVID-19 Vaccine: Vaccinate the Young to Protect the Old?, *Journal of Law and the Biosciences*, at https://academic.oup.com/jlb/article/7/1/lsaa050/5860822

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