

## **Emerging from lockdown – what went wrong?**

*Philippe van Basshuysen and Lucie White*

### **Abstract**

As many Western countries emerged from initial periods of lockdown in spring 2020, they had brought COVID-19 infection rates down significantly. This was followed, however, with more drastic second and third waves of viral spread, which many of these same countries are struggling to bring under control, even with the implementation of further periods of lockdown. Could this have been prevented by policymakers? We revisit two strategies that were focus of much discussion during the early stages of the pandemic, and which were implemented in several Western countries, albeit in a weakened form. These strategies both proceed by targeting certain segments of the population, while allowing others to go about their lives unhindered. The first suggests selectively isolating those that would most likely suffer severe adverse effects if infected – in particular the elderly. The second involves identifying and quarantining those who are likely to be infected through a contact tracing app that would centrally store users' information. We suggest that both strategies showed promise in preventing the need for further lockdowns, albeit in a significantly more stringent form than anything that was implemented in Western countries. We then proceed to an ethical evaluation of these more stringent policies. We contend that selective isolation strategies face severe ethical problems due to its discriminatory nature, while the ethical issues with a more aggressive contact tracing regime can be mitigated. This analysis has implications for how to respond effectively and ethically to future pandemics, and perhaps contains lessons on how to successfully emerge from our current predicament.

**Keywords.** COVID-19; lockdown; contact tracing; selective isolation; discrimination; privacy

### **1 Introduction**

Philosophers are increasingly scrutinizing whether, or under what circumstances, lockdown policies can be justified in the fight against the COVID-19 pandemic (Broadbent and Smart 2020, Godfrey-Smith 2020, Winsberg et al. 2020, van Basshuysen and White 2021). In this paper, we consider an important question that is complementary to this line of inquiry: what measures should have been implemented in order to emerge safely from

lockdowns and avoid the need for further lockdowns? Many countries, especially in Europe and North America, have failed to put in place safe exit strategies. One year after the first wave of COVID-19 in spring 2020, in which these countries attempted to prevent their healthcare systems from becoming overwhelmed by instituting general lockdowns, many countries worldwide are facing severe waves of COVID-19, with cases having exploded to many times the level of their initial peak in April 2020, especially in the US (JHU 2021) and in many European countries (ECDC 2020). Due to the dire economic and other consequences of such measures, many European and US leaders were extremely reluctant to return to lockdown conditions, but did so after long delays and a desperate scramble to find viable alternatives (Beneke 2020; Ho and Pengelly 2020).

Was there any way that policymakers could have avoided this situation? Could we have emerged from an initial lockdown with measures in place to control infection rates in a sustained manner, preventing further spikes and lockdowns? We revisit two strategies that attracted sustained attention and discussion during the early stages of the pandemic, and that were implemented in several Western countries in weakened forms. Both propose that the need for further general lockdowns could have been avoided by refocusing our attention on a certain segment of the population, and isolating these segments in a targeted fashion, while allowing others to continue their lives unhindered. The first is a selective isolation strategy, which involves identifying the segments of the population that are particularly vulnerable to COVID-19 (that is, the population that is most likely to be severely adversely affected by infection, and is thus more likely to require hospitalization), as well as those that are in close contact with that group, and increasing the restrictions on these groups, while relaxing restrictions on others (van Bunnik et al. 2020). The second is a digital contact-tracing app, with the ability to quickly identify those that have been in contact with possible carriers of the virus (and are thus most likely to pass the infection onto others), and put them into temporary quarantine (Ferretti et al. 2020).

Both of these broad measures were implemented in various countries during or after the first wave of the pandemic, but failed to have the kind of sustained impact initially anticipated by both public discussion and mathematical modelling. We first sketch out each of these options, considering the initial evidence, based on mathematical modelling, for the impact of these policies, and suggesting that each must be implemented in a more stringent form than what we have seen in practice to live up to this promise. But the potential

efficacy of these policies does not settle the question of whether they should have been enacted, as each raises potential ethical concerns. We thus turn to an appraisal of the benefits and drawbacks of each option, by considering two ethically significant ways in which these strategies differ.

First, we show that the manner in which segments of the population are *targeted* for isolation differs in an ethically significant way between the strategies. Selective isolation relies on group membership in determining who should be locked down, which, we argue, constitutes problematic discrimination against the elderly and other vulnerable groups. By relying on individual characteristics, a contact-tracing app is not subject to the same concern. While the individuals targeted for quarantine by the app might correlate with certain groups, and potentially result in indirect discrimination, we argue that this should be attributed to, and can best be ameliorated by, focusing on the background conditions that may lead to unjust infection patterns, rather than contact tracing. However, the focus on individuals brings with it its own ethical problems; namely, the tracking of individuals raises potential privacy concerns. We consider these issues, and argue that they can be mitigated.

We will then explore the ethical implications of the *aims* of each strategy. Selective isolation is often defended on the grounds that it benefits the individuals subjected to lockdown by protecting them from the adverse consequences of severe infection. We suggest that this defense is problematic for two reasons: it is not clear that isolation is indeed to the benefit of those isolated, and this means of justification exacerbates the discriminatory nature of this strategy. Finally, we draw out some implications concerning the ethical permissibility of each strategy, arguing that the contact-tracing strategy is ethically preferable to selective isolation and that there was a strong case for instituting it in the wake of initial lockdown measures.

## **2 Alternatives: selective isolation vs. contact tracing**

### ***2.1 What won't work***

Before we proceed to the ethical assessment of selective isolation and contact tracing, we should explain why, in the absence of a vaccine and effective treatment of COVID-19, these measures were regarded by many as the most promising means of avoiding the need for general lockdowns. Several other options for controlling the growth rate of infection

were proposed or implemented, but there was reason to doubt that each on its own, constituted an effective means of infection control:

There is evidence, both empirical and based on mathematical modelling, that the wearing of *cloth masks* in public places, combined with other public health measures such as hand hygiene, can reduce community spread (see Howard et al. 2020). However, given that second waves raged in countries such as France, where masks are mandated in public places, and Spain, which also has a mask mandate and very high compliance (and where both countries implemented such a policy prior to the advent of the second wave) (see Felter and Bussemaker 2020), it looks likely that further measures for epidemic control are required in addition.

*Local lockdowns* can work where infections are concentrated in a certain isolated area, but in densely populated areas they are likely to suffer from spillover infections from neighboring areas. When the virus is dispersed among the population, local lockdowns are only effective when all neighboring areas are locked down too (Li, Y. et al. 2020). The implementation of local lockdowns under the conditions currently facing many countries is likely to lead to a pattern of “repeated surges and falls until such times as the virus has eaten its way through all exposed and vulnerable people” (Wise 2020, 1).

Another strategy which has attracted much discussion is the use of *immunity passports* – documents that could allow individuals who have already been infected, and thus built up an immunity to COVID-19, to engage in a variety of activities, while restricting the movements and activities of others. In Israel, such passports are now available for persons who are vaccinated and those who previously contracted the virus and have presumably built up natural immunity (Holmes and Kierszenbaum 2021). However, at the time when many governments emerged from the first lockdowns, there was insufficient information to gauge whether immunity passports might constitute a promising strategy. It was unclear what (if anything) might function as a reliable and easily testable correlate to immunity (Huang et al. 2020), and whether individuals that have been infected will indeed exhibit immunity, and if so, for how long (Deutscher Ethikrat 2020; Grassly et al. 2020). And there was reason to doubt that, even if previous infection protects an individual from severe symptoms upon reinfection, that it will have an effect on their ability to transmit the virus to others (Brown et al. 2020).

With that, let's turn to the two strategies that may show promise when implemented in the right way; selective isolation of certain vulnerable groups in society, and digital contact tracing coupled with immediate quarantine. Although these two measures differ in many particulars, they can be viewed as subscribing to the same overall strategy; they both aim to replace general lockdowns by increasing the *specificity* of lockdown measures (targeting only a certain subset of the population) while retaining *sensitivity* (ensuring, to the greatest degree possible, that high-risk cases<sup>1</sup> are not missed). We will draw this out by looking at each strategy in turn.

## ***2.2 Selective Isolation***

A selective isolation policy involves dividing the population into sections: those particularly vulnerable to COVID-19 (sometimes with the additional category of those in close contact with this group, like caretakers), and the rest of the population. People in the first (two) group(s) are isolated, allowing the rest of the population to go about their lives with fewer restrictions (see e.g. van Bunnik et al 2020). Several mathematical models of this broad strategy have been produced (e.g. Ferguson et al. 2020; McKeigue and Calhoun 2020; Neufeld et al. 2020; van Bunnik et al. 2020; Weitz et al. 2020), and recommendations along these lines were implemented in Sweden and the UK during the first wave of the pandemic (Hughes 2020; Swedish National Board of Health and Welfare 2020; The Local 2020). This broad idea also gained traction for a while in the US, with the release of the Great Barrington Declaration, in which a group of prominent epidemiologists and public health scientists, among others, suggested a strategy along these lines as an alternative to continuing general restrictions (see Kulldorff et al. 2020). As a result of this declaration, this strategy was endorsed for a time by the White House (Porter 2020).

These models and policies have tended to focus on people over 70 years old as candidates for isolation, as well as people with underlying illnesses, such as diabetes, who have been shown to be particularly likely to suffer serious adverse effects from COVID-19 (Williamson et al. 2020). The aim of this strategy is to prevent the health care system from becoming overwhelmed by ensuring that the persons most likely to require hospitalization

---

<sup>1</sup> In the case of selective isolation, “high risk” refers to high risk of adverse consequences in the event of infection, and in the case of contact tracing, “high risk” means high risk of already being infected (and thus transmitting the virus to others).

do not get infected. This type of policy thus increases *specificity* of lockdown measures by identifying a certain factor that correlates with increased risk, and isolating the segments of the population that exhibit this factor. Of course, the cost of this increased specificity is decreased *sensitivity*; there will be people that do not exhibit this risk factor that will suffer severe adverse effects of COVID-19, leading to hospitalization and/or death.<sup>2</sup> But the mathematical models suggested that this policy could achieve sufficient sensitivity to keep the numbers of patients that must be hospitalized to manageable levels, provided that compliance is sufficiently high, which may have required mandatory rather than recommended isolation of the targeted groups (van Bunnik et al. 2020). These policies, where implemented, were unsuccessful, particularly in Sweden, where the virus spread through aged care facilities, and where residents of these facilities constituted more than 70% of total deaths. Part of the reason for this was the introduction of the virus into these institutions by caregivers (Stern and Klein forthcoming), indicating a need for more stringent isolation measures, particularly concerning contact restrictions for caregivers and others in close contact with residents from these institutions (the “shielders”, in van Bunnik et al.’s (2020) vernacular).

For the purposes of our analysis, it is worth drawing attention to three features of this strategy. The first is that it must proceed by targeting certain *groups* – groups that exhibit the factor that puts them at increased risk. We will, in the remainder of this paper, focus on the elderly, but our arguments could also be applied to those with underlying diseases. Second, this policy will require the *extended isolation* of the targeted group (van Bunnik et al. 2020), potentially until an effective treatment or vaccine can be implemented (Savulescu and Cameron 2020). Third, this policy aims to *prevent* the people directly targeted by the policy from contracting COVID-19 in the first place. This means that this policy can be, and often is, justified on the basis that it protects those who are subject to the most stringent restrictions.

### ***2.3 Contact Tracing***

Another promising measure for increasing the specificity of lockdown measures while retaining sufficient sensitivity is a digital contact-tracing app. While the overarching aim of reducing the burden on the healthcare system is the same, this policy attempts to identify

---

<sup>2</sup> The inclusion of the third group of caretakers conversely reduces specificity while increasing sensitivity – by isolating more people, the risk that those in high-risk groups will be infected decreases.

those who are most likely to already be infected, and reduce the risk that they will transmit the infection to others by sending them into quarantine. Mathematical modelling studies suggested that a digital contact tracing app might be a sufficient means of achieving epidemic control, bringing the reproduction number under 1, as long as it exhibits certain attributes (Ferretti et al. 2020; Hinch et al. 2020), which most Corona apps that were put in place lack.

First, in order to be sufficiently *sensitive*, digital contact tracing will need to identify likely index cases, and alert those who have had high-risk contact with them, quickly (Hernández-Orallo et al. 2020; Kretzschmar et al. 2020). Contact tracing apps often operate by exchanging Bluetooth signals when two users come into close proximity with each other. Because this allows all high-risk contacts to be alerted immediately when an index case reports infection (and because it can provide a more complete record than manual contact tracing) digital contact tracing has been regarded as a promising mitigation measure in the context of COVID-19 (Ferretti et al. 2020; Troncoso et al. 2020). But according to the mathematical modelling studies, in order to achieve sufficient sensitivity to prevent a general lockdown, such an app would further need to allow users to report infection as soon as they experience symptoms of the virus, and these reports would have to result in immediate quarantine of their high-risk contacts, rather than, as is the case with many apps at the moment, waiting until they receive a positive test result for COVID-19. Requiring users to seek a test and receive a positive diagnosis before reporting infection on the app introduces delays that will lead to further transmission before contacts can be alerted.

Increasing the sensitivity of this measure in this manner entails a corresponding decrease in *specificity* – eschewing a confirmation requirement will lead to false positives, and thus the erroneous quarantine of contacts. This effect can be mitigated, and an appropriate balance between sensitivity and specificity reached, by allowing the app to collect some pseudonymized information on a central server – a permanent pseudonymous identifier of each app user, and a record of the pseudonymous identifiers of contacts. This would allow the system to identify likely false positives – if the false positive is followed up with a negative test, or if a sufficiently low number of contacts are subsequently infected. This

would allow erroneously quarantined app users to be quickly released.<sup>3</sup> Additionally, and as above, in order to achieve epidemic control, this policy would require high uptake (Hinch et al. 2020), potentially necessitating incentivized or even mandatory app use (for smartphone users).

In contrast to selective isolation, rather than zoning in on certain groups, a contact tracing app isolates users based on their *individual* movements. Furthermore, this strategy requires *short periods of isolation*. Finally, those who are isolated under this policy are those who are likely to already be infected – the aim here is to *interrupt* the spread of infection, protecting others from infection, rather than the individuals isolated.

Having established, based on mathematical modelling, what selective isolation and contact tracing strategies would likely need to look like in order to be effective – thus explaining why less stringent strategies that were in fact implemented were unsuccessful in curbing the spread of the pandemic – we can now proceed to an ethical evaluation of these rival strategies. We do so by comparing, first, the ways in which the strategies target the respective segments of the population, and second, their aims.

### **3 Targets**

#### ***3.1 Targeting groups***

As we have seen, selective isolation would target a specific group – in particular the elderly – by locking down members of that group. This is a case of statistical discrimination, that is, taking salient features as proxies for a property of interest – in this case, the propensity to develop complications if infected – and treating individuals differentially on this basis. But not every differential treatment based on statistical generalizations is a moral wrong, for instance, requiring young males to pay higher car insurance premiums is not generally regarded as wrongful discrimination. Thus, we should begin by asking, would selective isolation wrongfully discriminate against the elderly?

The answer to this question depends on precisely why and under what circumstances one thinks discrimination is wrong. Three families of views can be distinguished, each of which suggests that this policy should be seen as involving a problematic form of discrimination.

---

<sup>3</sup> For a more detailed account of an effective app configuration, see White and van Basshuysen (forthcoming).



First, on harm-based accounts of discrimination, discrimination is wrong when and because it does harm to those targeted. Selective isolation would harm the elderly in two ways.<sup>4</sup> First, there are the direct effects of prolonged isolation, including, but not limited to, potential loss of income, limited opportunities to socialize, and decreased mobility. Second, this policy might foster or exacerbate hostile attitudes towards the elderly, for example, that they should not be treated as fully autonomous persons, or that they are a drain on societal resources. Moreover, if one believes that the wrongfulness of discrimination is proportional to the degree to which the individuals discriminated against are already disadvantaged – Kasper Lippert-Rasmussen (2014) has convincingly argued for such a prioritarian view of discrimination – selective isolation of the elderly would constitute a particularly serious case of wrongful discrimination. This policy would exacerbate the disadvantages (e.g. lack of mobility, social opportunities) and stigma faced by an already disadvantaged and stigmatized group.

Many accounts, however, root the wrongfulness of discrimination in concerns that go beyond harm, by focusing on the meaning expressed by an act of discrimination. According to Deborah Hellman, wrongful discrimination is an act by an agent in a position of power that demeans the persons who are targeted by that act, in the sense that the act conveys the *social meaning* that those persons are of lower moral status than others (2008; 2017). What a lockdown of the elderly expresses, according to this view, depends on economic, cultural, and historical factors, such that in a society where the elderly are generally stigmatized, this policy will express that the elderly are second-class citizens, a threat to health care systems, that is best to isolate them from general society, and so on. The meaning of this policy would be less problematic in a society in which the elderly were generally regarded as equal members of society. Because there is reason to think the elderly are in fact a stigmatized group in most Western societies (Richeson and Shelton 2006),<sup>5</sup> it follows that on the basis of the social meaning expressed by it, a lockdown of the elderly would constitute a considerable wrong.<sup>6</sup>

---

<sup>4</sup> In the next section, we will discuss whether those locked down might also benefit from this policy, and whether this could outweigh the types of harm (or other discriminatory effects) discussed here.

<sup>5</sup> The same is true of other groups that are particularly vulnerable to COVID-19, such as people with diabetes (see Schabert et al. 2013). Thus, while our focus here is on the elderly, our arguments extend to other groups that may be subject to isolation policies, too.

<sup>6</sup> Other accounts root discrimination in the meaning that the discriminator attaches to his act, which can differ from the social meaning of the act. For instance, according to Larry Alexander, an act is wrong if the actor's beliefs are morally or factually erroneous (1992). But Alexander restricts his analysis to the context of discrimination by private parties, and applying such accounts to contexts of public policy would generally

The third family of views on discrimination holds that cases of wrongful discrimination are intrinsically wrong, over and above the harm that they do to the persons discriminated against, and contingent facts, such as stigma of a certain group, that determine social meaning. Benjamin Eidelson argues that discrimination is wrong when and because the discriminator disrespects those they discriminate against, where this disrespect, in cases of statistical discrimination, stems from a failure to treat people as autonomous agents (2015). Subjecting the elderly to a policy of isolation, singling them out as unable to make reflective decisions concerning how to conduct themselves, amounts to a denial of their capacity to act as autonomous agents,<sup>7</sup> and would thus wrongfully discriminate against them on this account. Sophia Moreau's view that the violation of an equal right to freedom constitutes wrongful discrimination would produce a similar explanation as to why locking down the elderly is wrong (2010).

Further nuance might be added to this discussion. For example, some theorists have argued that it is particularly pernicious to discriminate against people on the basis of characteristics, such as race or sex, that people cannot easily choose or alter (Singer 1983). This provides further reason to think that isolating only the elderly is particularly problematic, since age is not a voluntarily chosen characteristic. The point of this discussion is simply that, while proponents of different accounts of the wrongfulness of discrimination might take issue with different aspects of this policy, it seems safe to say that they will be united in their agreement that such a selective isolation policy constitutes wrongful discrimination.<sup>8</sup>

---

raise the question of whether there exists an agent in the relevant policy-making process that can be attributed the beliefs that are required for the policy to be discriminatory. Because such an agent might not exist in a democratic decision-making process, we omit these accounts.

<sup>7</sup> We will return to this general point in more detail in the subsequent section.

<sup>8</sup> It might be countered that locking down the elderly is not wrongful discrimination on a rather popular view on discrimination, according to which discrimination is wrong when it treats individuals in salient groups arbitrarily or irrationally (e.g. Schauer 2003). As a selective isolation policy targets the elderly because they are particularly vulnerable to the virus, targeting them is not arbitrary or irrational, and such a policy would thus not be wrongful discrimination, on such "irrationality"-views. These views, however, do in general not yield plausible explanations for why cases of *statistical discrimination* are wrong. For it is a defining feature of statistical discrimination that it is "rational", in the sense that those salient features are targeted which correlate with a property of interest. On an irrationality-view, successful cases of statistical discrimination could thus never be morally wrong, which is clearly implausible.

### ***3.2 Targeting individuals***

In contrast to selective isolation, contact tracing does not target people on the basis of salient features, but is rather based on individual behavior: is an individual likely to have had contact with an infected person? This policy would thus not directly discriminate against certain, socially salient groups. But it may nevertheless have a disparate impact on people in such groups, which could be thought to constitute *indirect discrimination*. This would be the case if the members of a salient group were systematically more likely to be in contact with infected persons than other people, and thus more likely to be sent to quarantine by the app. There are reasons to think that this is indeed the case. For instance, because workers in precarious employment conditions are less likely to work from home, while at the same time being more likely to form social ties with workers in similar conditions, they may be more likely to be exposed to the virus and to be sent to quarantine by the app (Klenk and Duijf 2020). While such hypothesized correlations between salient features and likelihoods of being sent to quarantine by the app would require empirical confirmation, this kind of concern would not constitute an argument against contact tracing. If the virus is disproportionately contracted by workers in precarious employment conditions, or by members of some other salient groups, the app is not the source of this disparity. Rather, what needs to be tackled are the background conditions that allow a situation to occur in which the burdens of the pandemic are disproportionately shouldered by people who were already worse-off before. For instance, these conditions could be mitigated for workers in precarious employment, by providing adequate on-the-job safety to avoid infection, as well as job protection and compensation in case they do get infected.<sup>9</sup> But if someone does get infected, they should be quarantined, whether they are in precarious or in privileged jobs, and if the app achieves that, this is not wrongful discrimination.<sup>10</sup>

---

<sup>9</sup> Measures of this kind will be needed regardless of the policy response adopted. Women and minority workers have been put in a particularly precarious position due to the pandemic, and are disproportionately affected by general lockdown conditions. Minorities are also disproportionately likely to die from COVID-19 (see Fawcett Society et al. 2020), making the absence of effective measures highly problematic from this standpoint.

<sup>10</sup> It might be argued that if people in some salient groups are more likely to contract the virus, not only will the app report more true positive cases among these groups, but also more false positives. In response, we emphasize that in the system that we have envisioned in the previous section, false positives will be quarantined for short periods of time only and will be released from quarantine quickly. In this way the damage done to them can be reduced. An effective contact tracing app could also do more to mitigate the disproportionate harm caused by disproportionate infection rates. Again, the key here will be putting adequate protective measures in place to mitigate the negative effects of holding precarious employment during a pandemic.

The focus on individuals, rather than on groups, is preferable when it comes to discrimination. But focusing on the characteristics of individuals when determining whom to quarantine brings with it a different set of concerns. These are the much-emphasized concerns about privacy, which have dominated the discussion of the use of contact-tracing apps since its inception. A chief concern here is that data gathered by these apps could be misused to surveil citizens (see Troncoso et al. 2020). This focus has led to the popularity of so-called “decentralized” contact-tracing apps, where all individual information is stored on the individual’s own smartphone. We have argued, however, that in order to bring the epidemic under control without sacrificing specificity, an effective contact-tracing app will need to store some (pseudonymized) information about individual users on a central server. Could such a measure be ethically justifiable?

It should first be noted that most of these concerns are not peculiar to a digital system that stores users’ pseudonymous identifiers. For manual contact tracing, as it is currently practiced in many countries, also generates data that allow health authorities to identify the contacts of infected persons. Unlike those generated in an app, these data are not pseudonymized and could thus potentially be misused more easily. This highlights the need for effective legislation concerning all contact-tracing methods, preventing information gathered in this manner from being used for non-public health purposes such as law enforcement or immigration control (e.g. New York State Senate 2020).

Critics of centralized systems have noted a further potential problem, namely that the server hosting the pseudonymous identifiers might be hacked. However, as cryptographers have pointed out, neither centralized nor decentralized systems are immune to potential breaches (Ahmed et al. 2020; Vaudenay 2020). It has also been noted that hacking the central server and revealing users’ identities to malicious actors would likely require a government authority to collect information when users register on the app, and that breaches revealing users’ identity are generally easier to conduct in decentralized systems (Vaudenay 2020). This is because in a decentralized system, when someone reports an infection, their phone uploads an ephemeral identifier to a central server, which other phones in turn download from the server. This makes it possible for any tech-savvy user to track other users’ identifiers and then compare them with the downloaded identifiers, thus identifying infected users. Centralized apps, in contrast, can be better protected against attacks, leading some cryptographers to suggest that privacy-conscious users would rather

report an infection in a centralized system, and empirical evidence suggests that this is indeed the case (Li, T. et al. 2020). What this discussion of privacy concerns shows is not that the envisioned system is problem-free, but rather that many existing forms of contact tracing (both manual contact tracing, and decentralized contact-tracing apps) are no less problematic, and furthermore that these problems can be mitigated through adequate design, legislation, and supervision.

Summing up the comparison between the two kinds of policies, we have found selective isolation to constitute problematic direct discrimination against the elderly. Might this nevertheless be a justifiable means of avoiding a general lockdown, as Julian Savulescu and James Cameron (2020) have argued? No, because there is another viable option, digital contact tracing, that does not directly discriminate against members of socially salient groups. While it is possible that contact tracing might have disproportionate effects on some socially salient groups, the root of this problem can be traced to the background conditions that have led to the costs of the pandemic being unfairly distributed, and must be ameliorated by tackling these background conditions directly (as will be necessary no matter what pandemic-mitigation strategy we adopt). Furthermore, while contact tracing as envisioned here raises privacy concerns, these are not exclusive to this policy, but are rather common to all contact-tracing efforts, and they can be dealt with through adequate regulation (see White and van Basshuysen forthcoming). Because these problems are surmountable, contact tracing appears, at this stage, to be a preferable alternative means of avoiding a general lockdown.

#### **4 Aims**

However, there might be a potential saving grace of a selective isolation policy, or more specifically, an alternate way in which it might be justified. As outlined in section 2, a crucial difference between the two policies is that selective isolation aims to intervene *before* the targeted group is infected. A contact tracing app, on the other hand, imposes isolation on the targeted group *after* infection. Though both might constitute effective ways to prevent the healthcare system from inundation, selective isolation can also be justified on the grounds that it *protects* those directly affected by the policy – by protecting them from infection and the potential serious consequences. Indeed, this justification is central to the policies and documents advocating the selective isolation of the elderly (Hughes 2020; Kulldorff et al. 2020; Savulescu and Cameron 2020; Swedish Ministry for Health and Social

Affairs 2020; van Bunnik et al. 2020). Given that there is a potential personal benefit to submitting to selective isolation, could this make the policy justifiable? Should this cause us to revisit our earlier contentions about the discriminatory effects of the policy? There are two problems with this justification, when employed in support of selectively isolating the elderly: first, rather than mitigating the discriminatory implications of the policy, it may in fact exacerbate them, and second, it is doubtful that selective isolation should indeed be straightforwardly regarded as benefiting those isolated. Let's consider these problems in turn.

Concerning the discrimination-exacerbating effects, let us assume, for the time being, that the protective effects of selective isolation should lead us to construe isolation as a benefit for those isolated. Even if this is the case, this justification would exacerbate the wrongfulness of the discrimination on at least two of the families of accounts we looked at above. This comes out most clearly when we look at social meaning accounts of wrongful discrimination. Remember that according to Hellman, discrimination is wrong when it is demeaning, *expressing* that the person affected by a policy is not of equal moral worth (Hellman 2017). To isolate the elderly on the grounds that this is what's best for them, effectively denying them a chance to determine what is in their own best interests, while leaving others free to make these decisions for themselves, is to treat the elderly as if they in particular do not have the capacity to make their own self-regarding decisions. Being treated as if you are not able to make your own self-regarding decisions is "demeaning", and expresses that the individuals targeted by this policy "do not have the standing normally accorded to an adult member of society" (Scanlon 1999, 253).

Furthermore, it reinforces the problematic and already widespread assumption that elderly people do not have the capacity to make their own decisions (Regan 1981). Basically, insofar as a selective isolation policy is espoused on the grounds that it will protect the people that will be isolated, it amounts to paternalism, often seen as problematic because it exhibits an attitude of disrespect towards the agent (see Davis 2017). When a class of people is treated as if they are uniquely unable to make their own decisions, this conveys a demeaning attitude towards this group, and exacerbates any existing stigma concerning their moral worth and capacity to participate as full-standing members of society. This type of justification will clearly also be problematic if one subscribes to a disrespect-based account of the wrongfulness of discrimination (along the lines of Eidelson). Even if one

accepts that selective isolation is a benefit to those isolated, the deployment of this paternalistic justification for the policy exacerbates its discriminatory impact according to both of these accounts.

It is less clear, however, whether the same conclusion follows if one regards discrimination as wrong if and because it *harms* those discriminated against. On such a view, whether the protection-based justification would exacerbate or mitigate the wrongness of selective isolation depends on the question of how harm is constituted. In a “multi-dimensional” conception of harm, the specific way in which a discriminatory policy harms those discriminated against is a stand-alone wrong, and even if this policy were also to benefit those discriminated against (by protecting them), this benefit could not make up for the harm that it imposes (lack of social and financial opportunities). On such a conception, selective isolation is wrongful discrimination on account of the harm that it does, independent of the benefits that it might imply.

In contrast, if one regards harm as one-dimensional – as Lippert-Rasmussen does (2014, 167) – selective isolation would cease to be wrong if its benefits were to exceed its harms. We will argue below that it is doubtful that selective isolation policies can plausibly be construed as benefitting the isolated, so that the justification of selective isolation on grounds of their alleged benefits fails on harm-based accounts, even if harm is regarded as a single dimension that could in principle be neutralized by benefiting those that are harmed.<sup>11</sup> Note, moreover, that many of the features exacerbating the wrong of selective isolation on other accounts of discrimination, such as the demeaning signification, or lack of respect, may impose additional harm on the people targeted by these policies, and would thus also exacerbate the severity of the discrimination on harm-based accounts (no matter if harm is seen as modular or one-dimensional).

---

<sup>11</sup> A harm-based account that regards harm as a single dimension, such as Lippert-Rasmussen’s, has the general implication that wrongful discrimination can be evaded if the victims of a discriminatory policy are compensated for the harm they suffer as a result of the discrimination. Thus, in the case of selective isolation, assuming there is a way of valuing the harm that this policy does to the people isolated, they could be paid the same value in money, so that the lockdown policy would cease to be a case of wrongful discrimination on this account. It would however not be a convincing strategy to defend selective isolation by promoting this policy combined with simultaneous compensation of those isolated for the harm they suffer from their isolation. After all, *any* discriminatory act could be defended along these lines if one adheres to such an account, but it would be implausible to argue that any discriminatory act would cease to be wrongful if only its victims were compensated. Rather, this implication should be seen as an idiosyncratic (and perhaps problematic) artifact of this harm-based account.

Before we turn to this claim about the benefits of selective isolation, it should be emphasized just how the paternalistic justification of selective isolation differs from arguments for contact tracing. Contact tracing, as we have noted, targets people that are already likely to be infected with the coronavirus. The purpose of quarantine is to protect others, rather than self-protection. It is well accepted that interfering with a competent individual's freedom of choice is problematic and demeaning when the action is self-regarding – but when actions are other-regarding, restrictions on freedom do not have the same demeaning connotations. Although consent is widely regarded as necessary for interventions in medical ethics, when it comes to public health ethics, which deals with other-regarding issues such as the spread of infectious disease, coercive and compulsory measures are seen as sometimes justifiable (Pugh and Douglas 2016). As we have seen, however, self-protection is not the only potential justification for selective isolation. This can also be justified on other-regarding grounds – if too many elderly people become infected, they will use a disproportionate amount of medical resources, which could compromise the care of others that become infected. Our point here is just that insofar as this policy (as it so often is) is justified on the grounds that it will protect those affected, it exacerbates the demeaning and disrespectful implications of this policy.

But let's put aside, for a moment, the demeaning implications of this type of paternalistic justification. If it really confers a significant benefit on those directly impacted, perhaps these discriminatory implications might pale in comparison (or perhaps one subscribes to a one-dimensional account of harm and a harm-based account of discrimination, and thus thinks that significant benefits should lead us to no longer regard this policy as discriminatory). Should we see the impact of this policy as involving such a benefit for those isolated? There are two reasons that the benefit for the individuals isolated is far from clear. The first is that although elderly people are much more likely than those in younger demographics to experience serious complications as a result of contracting COVID-19, the vast majority of those over 70 who do become infected will not experience serious complications. Only about 18.4% of those over 80 who contract the virus need to be hospitalized. For 70-79 year olds, the proportion is 16.6% (Verity et al. 2020). The fact that most of those that must be isolated would not in fact suffer serious harm as a result of contracting the virus weakens the case that this can be justified on the basis of the benefit conferred to each individual in this group.



The second reason is that the prolonged isolation that this policy requires in order to function adequately can take a severe toll on mental health, and leads to the loss of valued opportunities, such as the ability to interact face-to-face with friends and family. It is just not clear here that the reduced risk of infection straightforwardly constitutes a benefit, given the high price that must be paid. Even if we accept that freedom of movement may indeed be justifiably restricted for these individuals' own good, the case that this does indeed constitute a benefit is not sufficiently strong here. This is a prime example of a situation in which individuals must be free to decide for themselves what is in fact in their own best interest, and to act accordingly. Here, we have arrived at the second classic anti-paternalist argument – that individuals are in the best position to decide for themselves what constitutes a benefit, given their privileged knowledge of their own preferences and values. Where the benefit is so uncertain, and where what amounts to benefit is so dependent on what the individual prioritizes and values, the case for paternalism here is fatally weakened.

Again, this objection targets the policy only insofar as it is justified on the grounds that it is in the affected individuals' best interests. But it should be noted here that the burdens placed on the targeted group are more severe than under contact tracing in virtue of their duration – contact tracing and quarantine would, in contrast, only subject targeted individuals to short periods of quarantine, spanning from days to a couple of weeks. These considerations suggest that the selective isolation policy cannot gain additional justification on the grounds that it is in the best interests of those upon whom the most stringent measures are inflicted. The case that it is indeed in the best interests of the individuals affected is weak, and this justification could in fact exacerbate problems of discrimination by treating the elderly in a demeaning manner, suggesting that they are unable to make self-regarding decisions about their own wellbeing.

## **5 Conclusion**

Over one year after its initial outbreak, the COVID-19 pandemic continues to rage, and the long term outlook, despite vaccination campaigns, remains uncertain. Could we have avoided the severe second and third waves sweeping much of the globe, and the need for further damaging general lockdowns? We have identified two strategies, selective isolation and digital contact tracing, that attracted significant attention during the first stages of the pandemic. As there was evidence that each strategy, if implemented in a different and

significantly more stringent form to what we saw in practice, could achieve this, the question of whether either of these policies would have been ethically viable comes to the fore. We have argued, first, that the way in which selective isolation policies target salient groups, in particularly the elderly, constitutes wrongful discrimination. The contact tracing strategy exhibits an advantage here, as it does not discriminate against salient groups. While it might detect infection patterns that may be seen as unjustly disadvantaging certain salient groups, this should not be attributed to contact tracing, but rather to the background conditions that allow such infection patterns to evolve. Furthermore, while the individualized targeting of the app raises privacy concerns, we have argued that these can be mitigated.

Second, we canvassed a prominent justification of selective lockdown policies, namely that they aim to protect those directly impacted by the policy, an aim not shared by a contact-tracing app, which targets individuals for quarantine because they are already likely to be infected. We have argued, however, that this justification fails to support this strategy, but rather exacerbates its discriminatory nature, and that it rests on the assumption that extended isolation constitutes a benefit for the isolated, which cannot be established with sufficient clarity to provide any justification.

It follows from this appraisal of the benefits and drawbacks of the two available strategies that the contact tracing option is ethically preferable to selective isolation. This does not mean that this strategy is problem-free – contact tracing raises privacy concerns, which should be taken seriously. But, unlike the severe discrimination that selective isolation involves, contact tracing does not by design violate ethical norms; rather, we have argued that potential privacy violations could be diminished through adequate design, legislation and supervision. The COVID-19 pandemic has shown us the necessity of swift and uncompromising action and adequate preparation in formulating policy responses that can provide a means of avoiding the devastating consequences of the unchecked spread of infection, or of ongoing lockdowns. A reflection on the options that showed promise in the early stages of the pandemic, particularly concerning their ethical viability, may help us to prepare for future, similar situations. As new variants of the COVID-19 virus emerge, and vaccination campaigns face various hurdles that may not allow them to deliver the swift relief initially anticipated, we may also need to think about how to emerge from current general restrictions without repeating history.

## References

Ahmed, N., Michelin, R.A., Xue W., et al. (2020). A Survey of COVID-19 Contact Tracing Apps. *IEEE Access* 8:134577-134601. <https://doi.org/10.1109/ACCESS.2020.3010226>

Alexander, L. (1992). What Makes Wrongful Discrimination Wrong? Biases, Preferences, Stereotypes, and Proxies. *University of Pennsylvania Law Review* 141:149-219. <https://doi.org/10.2307/3312397>

Bates, A., Primack, R., Moraga, P., Duarte, C. (2020). COVID-19 pandemic and associated lockdown as a “Global Human Confinement Experiment” to investigate biodiversity conservation. *Biological Conservation* 248: 108665. <https://doi.org/10.1016/j.biocon.2020.108665>

Benecke, M. (2020). Coronavirus: Can European Countries Avoid a Second Lockdown? *Deutsche Welle*, September 21. <https://www.dw.com/en/coronavirus-can-european-countries-avoid-a-second-lockdown/a-54997364> (accessed October 7, 2020).

Broadbent, A., Smart, B.T.H. (2020). Why a one-size-fits-all approach to Covid-19 could have lethal consequences. *The Conversation*, March 23. <https://theconversation.com/why-a-one-size-fits-all-approach-to-covid-19-could-have-lethal-consequences-134252> (accessed February 22, 2021).

Brown, R.C.H., Kelly D., Wilkinson, D., et al. (2020). The scientific and ethical feasibility of immunity passports. *Lancet Infectious Diseases*. [https://doi.org/10.1016/S1473-3099\(20\)30766-0](https://doi.org/10.1016/S1473-3099(20)30766-0)

Davis, B. (2017). Paternalism and evaluative shift. *Moral Philosophy and Politics* 4: 325-46.  
Deutscher Ethikrat. 2020. Immunitätsbescheinigungen in der Covid-19-Pandemie [Immunity passports in the COVID-19 pandemic] (German). <https://www.ethikrat.org/fileadmin/Publikationen/Stellungnahmen/deutsch/stellungnahme-immunitaetsbescheinigungen.pdf> (accessed October 23, 2020).

Eidelson, B. (2015). *Discrimination and disrespect*. Oxford: Oxford University Press.

European Centre for Disease Prevention and Control (ECDC) (2021). COVID-19 situation update for the EU/EEA and the UK, as of week 50 2020. <https://www.ecdc.europa.eu/en/cases-2019-ncov-eueea> (accessed 22 February, 2021).

Fawcett Society, et al. (2020). BAME women and Covid-19: research evidence. <https://www.fawcettsociety.org.uk/Handlers/Download.ashx?IDMF=cae4917f-1df3-4ab8-94e7-550c23bdc9cf> (accessed July 20 2020).

Felter, C., Bussemaker, N. (2020). Which Countries Are Requiring Face Masks? Council on Foreign Relations. <https://www.cfr.org/in-brief/which-countries-are-requiring-face-masks> (accessed October 19 2020).

Ferguson, N., Laydon, D., Nedjati-Gilani, G., et al. (2020). Report 9: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand. MRC Centre for Global Infectious Disease Analysis. <https://doi.org/10.25561/77482>

Ferretti, L., Wymant, C., Kendall, M., et al. (2020). Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing. *Science* 368: 1-7. <https://doi.org/10.1126/science.abb6936>

Godfrey-Smith, P. (2020). Covid Heterodoxy in Three Layers. *Preprint*. <https://petergodfreysmith.com/wp-content/uploads/2021/01/Covid-Heterodoxy-in-Three-Layers-PGS-v2.pdf> (accessed February 22, 2021).

Grassly, N., Pons-Salort, M., Parker, E., et al. (2020). Comparison of molecular testing strategies for COVID-19 control: a mathematical modelling study. *Lancet Infectious Diseases*. [https://doi.org/10.1016/S1473-3099\(20\)30630-7](https://doi.org/10.1016/S1473-3099(20)30630-7)

Hellman, D. (2008). *When is Discrimination Wrong?* Cambridge: Harvard University Press.

Hellman, D. (2017). Discrimination and Social Meaning. In *The Routledge Handbook of the Ethics of Discrimination*, 97-118. New York: Routledge.

Hernández-Orallo, E., Calafate, C., Cano, J-C., Manzoni, P. (2020). Evaluating the Effectiveness of COVID-19 Bluetooth-Based Smartphone Contact Tracing Applications. *Applied Sciences* 10(20): 7113. <https://doi.org/10.3390/app10207113>

Hinch, R., Probert W., Nurtay, A., et al. (2020). Effective configurations of a digital contact tracing app: A report to NHSX. <https://045.medsci.ox.ac.uk/files/files/report-effective-app-configurations.pdf> (accessed July 2, 2020).

Ho, V., Pengelly, M. (2020). Millions of Californians put under strict Covid lockdown. *The Guardian*, December 7. <https://www.theguardian.com/world/2020/dec/06/california-covid-lockdown-us-new-cases-hospitalisations-deaths-stay-at-home-order> (accessed February 22, 2021).

Holmes, O., Kierszenbaum, Q. (2021). Covid: vaccinated Israelis to enjoy bars and hotels with 'green pass'. *The Guardian*, February 19. <https://www.theguardian.com/world/2021/feb/19/covid-vaccinated-israelis-to-enjoy-bars-and-hotels-with-green-pass> (accessed February 22, 2021).

- Howard, J., Huang, A., Li, Z., et al. (2020). Face Masks Against COVID-19: An Evidence Review. *Preprints*. <https://doi.org/10.20944/preprints202004.0203.v3>
- Huang, A., B. Garcia-Carreras, M. Hitchings, et al. 2020. A systematic review of antibody mediated immunity to coronaviruses: kinetics, correlates of protection, and association with severity. *Nature Communications* 11: 4704. <https://doi.org/10.1038/s41467-020-18450-4>
- Hughes, L. (2020). UK to ask over-70s to self-isolate for up to four months. *Financial Times*, March 15. <https://www.ft.com/content/26cc9170-669f-11ea-800d-da70cff6e4d3> (accessed October 9 2020).
- Johns Hopkins University and Medicine (JHU) (2021). New Cases of COVID-19 in World Countries. Coronavirus Resource Center. <https://coronavirus.jhu.edu/data/new-cases> (accessed February 22, 2021).
- Johnson, N.P.A.S., Mueller, J. (2002). Updating the Accounts: Global Mortality of the 1918-1920 “Spanish” Influenza Pandemic. *Bulletin of the History of Medicine* 76(1): 105-115. <https://doi.org/10.1353/bhm.2002.0022>
- Klenk, M., Duijf, H. (2020). Ethics of digital contact tracing and COVID-19: who is (not) free to go? *Ethics and Information Technology*. <https://doi.org/10.1007/s10676-020-09544-0>
- Kretzschmar, M., Rozhnova, G., Bootsma, M., van Boven, M., van der Wijkert, J., Bonten, M. (2020). Impact of delays on effectiveness of contact tracing strategies for COVID-19: a modelling study. *Lancet Public Health* 5: e452-59. [https://doi.org/10.1016/S2468-2667\(20\)30157-2](https://doi.org/10.1016/S2468-2667(20)30157-2)
- Kulldorff, M., Gupta, S., Bhattacharya, J. (2020). The Great Barrington Declaration. <https://gbdeclaration.org/> (accessed December 21 2020).
- Ledford, H., Cyranoski, D., Van Noorden, R. (2020). COVID Vaccines: What Scientists Now Want to Know. *Nature* 588: 205-6. <https://doi.org/10.1038/d41586-020-03441-8>
- Li, T., Yang, J., Faklaris, C., et al. (2020). Decentralized is not risk-free: Understanding public perceptions of privacy-utility trade-offs in COVID-19 contact-tracing apps. *arXiv e-print*. <https://arxiv.org/abs/2005.11957>
- Li, Y., Undurraga, E., Zubizarreta, J. (2020). Effectiveness of localized lockdowns in the SARS-CoV-2 pandemic. *medRxiv preprint*. <https://doi.org/10.1101/2020.08.25.20182071>
- Lippert-Rasmussen, K. (2014). *Born Free and Equal? A Philosophical Inquiry into the Nature of Discrimination*. New York: Oxford University Press.
- Mahase, E. (2020). Covid-19: UK approves Pfizer and BioNTech vaccine with rollout due to start next week. *BMJ* 371: m4714. <https://dx.doi.org/10.1136/bmj.m4714>

McKeigue, P., Colhoun, H. (2020). Evaluation of “stratify and shield” as a policy option for ending the COVID-19 lockdown in the UK. *medRxiv preprint*.

<https://doi.org/10.1101/2020.04.25.20079913>

Moreau, S. (2010). What is Discrimination? *Philosophy and Public Affairs* 38: 143-79.

<https://doi.org/10.1111/j.1088-4963.2010.01181.x>

Neufeld, Z., Khataee H., Czironk, A. (2020). Targeted adaptive isolation strategy for Covid-19 pandemic. *Infectious Disease Modelling* 5: 357-61.

<https://doi.org/10.1016/j.idm.2020.04.003>

New York State Senate (2020). An act to amend the public health law, in relation to the confidentiality of contact tracing information. *Senate Bill S8450C*.

<https://www.nysenate.gov/legislation/bills/2019/s8450/amendment/c> (accessed October 16 2020).

Porter, T. (2020). The White House is embracing a ‘herd immunity’ strategy that would allow COVID-19 to spread freely and is widely disputed by scientists. *Business Insider*,

October 14. <https://www.businessinsider.com/white-house-briefs-great-barrington-disputed-science-2020-10> (accessed December 21 2020).

Pugh, J., Douglas, T. (2016). Justifications for Non-Consensual Medical Intervention: From Infectious Disease Control to Criminal Rehabilitation. *Criminal Justice Ethics* 35(3):

205-29. <https://doi.org/10.1080/0731129X.2016.1247519>

Regan, J.J. (1981). Protecting the elderly: the new paternalism. *Hastings Law Journal* 32: 1111-32.

Richeson, J.L., Shelton, J.N. (2006). A Social Psychological Perspective on the Stigmatization of Older Adults. In *When I'm 64*, 174-208. Washington: National Academies Press.

Roser, M., Ritchie, H., Ortiz-Ospina, E., et al. (2020). Coronavirus (COVID-19) Deaths. *OurWorldInData*. <https://ourworldindata.org/covid-deaths> (accessed December 20 2020).

Savulescu, J. and J. Cameron. 2020. Why lockdown of the elderly is not ageist and why levelling down equality is wrong. *Journal of Medical Ethics* 46(11): 717-20.

<http://dx.doi.org/10.1136/medethics-2020-106336>

Scanlon, T.M. (1999). *What we owe to each other*. Cambridge: Harvard University Press.

Schabert, J., Browne, J.L., Mosley, K., et al. (2013). Social Stigma in Diabetes: A Framework to Understand a Growing Problem for an Increasing Epidemic. *Patient* 6: 1-10.

<https://doi.org/10.1007/s40271-012-0001-0>

Schauer, F. (2003). *Profiles, Probabilities, and Stereotypes*. Cambridge: Harvard University Press.  
Singer, P. 1983. Is Racial Discrimination Arbitrary? In *Moral Matters*, 185-203. New York: Oxford University Press.

Stern, C., Klein, D. (forthcoming). Stockholm's Elderly Care and Covid19: Interview with Barbro Karlsson. *Society*. <https://doi.org/10.1007/s12115-020-00508-0>.

Swedish Ministry for Health and Social Affairs (2020). About COVID-19: For older people, people with health conditions and health care and social services staff. <https://www.government.se/articles/2020/05/about-covid-19--for-older-people-people-with-health-conditions-and-health-care-and-social-services-staff/> (accessed October 13 2020)

Swedish National Board of Health and Welfare (2020). Statistik relaterad till covid-19 [Statistics related to covid-19] (Swedish). <https://www.socialstyrelsen.se/statistik-och-data/statistik/statistik-om-covid-19/statistik-relaterad-till-covid-19/> (accessed October 9, 2020).

The Local (2020). Coronavirus: What are the rules and recommendations in Sweden now? <https://www.thelocal.se/20200228/coronavirus-the-everyday-precautions-to-take-if-youre-in-sweden> (accessed October 9, 2020).

Troncoso, C., Payer, M., Hubaux, J., et al. (2020). Decentralized privacy-preserving proximity tracing (DP-3T White Paper). *arXiv e-print*. <https://arxiv.org/abs/2005.12273>

van Basshuysen, P., White, L. (2021). How Philosophers of Science Violated Their Epistemic Duties During the SARS-CoV-2 Crisis. *Preprint*. <http://philsci-archive.pitt.edu/18584/> (accessed February 22, 2021).

van Bunnik, B., Morgan, A., Bessell, P., et al. (2020). Segmentation and shielding of the most vulnerable members of the population as elements of an exit strategy from COVID-19 lockdown. *medRxiv preprint*. <https://doi.org/10.1101/2020.05.04.20090597>

Vaudenay, S. (2020). Centralized or decentralized? The contact tracing dilemma. *Cryptology ePrint Archive*. <https://eprint.iacr.org/2020/531> (accessed October 26, 2020).

Verity, R., Okell, L.C., Dorigatti, I., et al. (2020). Estimates of the severity of coronavirus disease 2019: a model-based analysis. *Lancet Infectious Diseases* 20(6): 669-77. [https://doi.org/10.1016/S1473-3099\(20\)30243-7](https://doi.org/10.1016/S1473-3099(20)30243-7)

Weitz, J., Beckett, S., Coenen, A., et al. (2020). Intervention Serology and Interaction Substitution: Modeling the Role of 'Shield Immunity' in Reducing COVID-19 Epidemic Spread. *medRxiv preprint*. <https://doi.org/10.1101/2020.04.01.20049767>

White, L., van Basshuysen, P. (forthcoming). Without a trace: why corona apps failed. *Journal of Medical Ethics*. <https://doi.org/10.1136/medethics-2020-107061>

Williamson, E., Walker, A., Bhaskaran, K., et al. (2020). Factors associated with COVID-19-related death using openSAFELY. *Nature* 584: 430-6. <https://doi.org/10.1038/s41586-020-2521-4>

Winsberg, E., Brennan, J., Surprenant, C.W. (2020). How Government Leaders Violated Their Epistemic Duties During the SARS-CoV-2 Crisis. *Kennedy Institute of Ethics Journal* 30(3-4):215-242. <https://doi.org/10.1353/ken.2020.0013>

Wise, J. (2020). Covid-19: Leading doctors argue against local lockdowns. *British Medical Journal* 371: m3959. <https://doi.org/10.1136/bmj.m3959>