

The implications of immunity passports

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SER Seminar Series via Webex Events

July 9th 2020

1. Introduction

Every epidemic, every pandemic, has presented new challenges and created new roles - for the public, for governments, clinicians, companies, and scientists - the cartoon on this slide, is taken from the Wellcome Images collection, and shows - not entirely sympathetically - officials of the London Board of Health "tracking and tracing" cases of cholera in 1832, suggesting they are as motivated by their 20 guineas a day as by their concern for public health.

This presentation focuses on one aspect of what the Ada Lovelace Institute describes as the "new public health identity" emerging through the Covid crisis - an identity emergent from our interaction with a combination of digital, medical, immunological and genomic tools and information.

I'm focusing on the case of so-called 'immunity passports', with the aim of introducing the idea and some of the debates around it.

First, I want to fill in a bit of background - much of which may be familiar, but which sets the scene for discussion of immunity passports or certificates.

I'll then discuss what's meant by immunity passports, and their potential value

Finally, I'll discuss some of the ethical and scientific challenges associated with immunity certification.

2. Lockdown

The coronavirus pandemic has had significant and traumatic social and economic effects around the globe. The vast majority of countries have implemented some kind of lockdown measures - with varying levels of stringency - as captured in this map from the

Oxford COvid-19 response tracker, which incorporates the level of restrictions across 9 measures - including school and workplace closures, travel controls and the like.

By mid-May, 94% of the world's workers were living in countries with some level of workplace closures or restrictions; schools were closed and public transport systems disrupted around the world.

3. Easing

While lockdown measures have now started to ease, for most of us life has by no means returned to 'normal'. Our work, school and social life are still characterised by social distancing measures. Take, for example, Google mobility data on Cambridgeshire, collected from Android device location data. It shows that levels of activity in the last couple of weeks have begun to tick up, are still way below 'baseline' or what would have been normal life pre-Covid.

The question and the challenge remains then, how can we continue and extend the easing of lockdown, and how do we do so in a way that minimises the impact on the rate of infection while enabling our social and economic lives to start moving.

4. Technology

From the earliest stages of the pandemic in Wuhan, science and technology have consistently been given a central role in not only understanding and treating the virus and its effects, but in tracking and controlling its movement, understanding the effectiveness of lockdowns and potentially in shaping a post-Covid society that gives us a route through lockdown but which may look radically different from the pre-pandemic world .

China, for example, was the first to use a smartphone based tool for indicating health status, which was essential for allowing people to travel within, and ultimately beyond, the containment zone. The AliPay HealthCode provides users with a colour-coded health status based on their travel history, time spent in outbreak hotspots and exposure to potential carriers of the virus. Other countries, including the UK, have launched or attempted smartphone based contact tracing systems, with varying degrees of success. Singapore augments its smartphone based approach with standalone bluetooth devices that are distributed to those without smartphones. In some countries, including South Korea, Russia and Ukraine, a smartphone app tracks the movements of users to ensure they are not breaking quarantine. In Karnataka, India, the Quarantine Watch app requires

individuals under quarantine to take a GPS-tagged selfie every hour between 7am and 10pm.

Alongside government efforts, tech companies such as Google and Apple have developed bluetooth based contact tracing systems, and digital health companies including FitBit and the smart ring company Oura are exploring the possibility of AI-based detection of presymptomatic signs of infection based on data from wearables, such as elevated heart rate or changes in breathing patterns - prompting the NBA basketball league to purchase rings to offer to players entering the league's Disney World quarantine bubble.

In addition to their potential public health value, however, these technological approaches have brought public health *ethics* to the fore - to what extent we accept surveillance of our movement and our health in a time of emergency, and the consequences of both being included and of being left out of these systems - in the case of the Ukrainian quarantine app for example, the NGO Human Rights Watch has highlighted cases of people being unable to enter the country, and being forced to spend nights outside in the disputed zone between Ukraine and Russia, simply for lacking the necessary technology to install the app.

5. Testing

Underpinning the potential value of much of this digital technology however, is biology - particularly testing for present or past coronavirus infection. As we've all heard since the beginning of the pandemic, testing is central to the public health response - from the World Health Organisation's exhortation to 'test, test, test', to the ever increasing and often-contested UK government targets for daily test figures.

By the start of this week, July 6, over 10 million tests for coronavirus had been either processed or sent out in the UK. Of these, the majority are tests for active infection, antigen testing conducted in hospitals, public health England labs or community programmes. A million or more antibody tests have also been carried out.

Whereas the swab testing can identify active infection, antibody testing can be used to establish whether someone has previously been exposed to the SARS-CoV-2 coronavirus. They can, in theory, be used from a week or so after the infection - although recent research suggests they are more accurate at least 2 weeks after infection.

In the early stages of the epidemic, there was a proliferation of tests purporting to offer antibody results based on analyses of blood drawn from a finger-prick. In the UK companies including Superdrug and Babylon Health sold such tests direct to consumers. Following intervention from the MHRA - the UK regulator responsible for medical devices - these tests have been withdrawn, and those tests currently approved for use rely on clinical blood draws.

Antibody tests can be used to estimate the proportion of a population that has been exposed to the virus. This week for example, a study of a cohort of 61,000 people in Spain estimated that around 5% of the population had been infected with coronavirus, with higher levels in major cities such as Madrid.

6. The value of antibody tests

In the UK, the Office of National Statistics' Coronavirus Infection Survey estimates that 6.3% of people in the UK carry Covid-19 antibodies - around 2.8 million people, while data from blood donors suggests that this number varies significantly by region. So, if you look at the purple line, you can see that the percentage of people in London with antibodies is somewhere between 12 and 14%, whereas in the East of England, it's likely to be about half of that.

In addition to the value for public health planning, it has been proposed that information on antibody status may have value for countries, employers, and individuals in the form of certification that an individual has contracted and recovered from Covid-19, and that consequently, they can be considered to have some level of immunity.

7. The immunity passport

The notion of the immunity passport, certificate or license refers to a "digital or physical document that certifies an individual has been infected and is purportedly immune to SARS-CoV-2" (Phelan 2020). It was first suggested in France and Germany in March, before being floated in early April by Matt Hancock at his first press conference after himself recovering from Covid-19. The concept was then explicitly included in the remit of the government's testing lead, Dido Harding.

A number of other countries have at least explored the idea, although only Estonia to date is apparently trialling the concept. If you're interested in the current state of affairs, the Ada Lovelace Institute is currently maintaining a tracker of national initiatives.

8. Opening up markets

Despite the lack of government action, a number of companies - both start-ups and those who have redirected efforts in other areas - are working to meet the potential demand for 'immunity passports', often combining a record of test status with a digital ID platform for verification. The company Prova for example, draws on the expertise and capacity of the molecular diagnostic company YourGene but is a spin-off from the financial tech company Hooha. Some of these companies, such as Covi-Pass and hVivo, have been reported to be in discussions with national governments about the implementation of immunity certificates but They are also aiming to serve the private sector. Employers such as Ernst and Young and PwC are thought to be exploring the potential for implementation, while other immunity certification companies are targeting the travel, hospitality or events industry.

9. Depth

Immunity passports then, are garnering interest, if not yet moving all the way to application. In the rest of my talk, I'm going to set out why they might be desirable, and why, for ethical, social and scientific reasons, they might be problematic.

Matt Hancock's statement sets out the main draw of the immunity passport. At a time of unprecedented restrictions on everybody's freedoms, immunity passports have the potential to finesse and nuance the brute force of a total lockdown, and to stratify and target measures.

In economic terms, recognising that some people may no longer be at risk of infection may allow parts of the economy to start moving in a more normal way. It might enable employers to place staff at least risk in positions of greatest exposure, whether in a health or social care setting, as bus drivers or in shops and bars. It may also allow a better allocation of resources to protect those who remain at greater risk, including targeting vaccination policies if and when that becomes possible.

Socially, certifying antibody status might provide some people with increased social privileges, for example to attend bars, restaurants or venues without the need for social distancing measures. . In the USA, the owner of the New York Knicks and Madison Square Garden, James Dolan, has already floated the idea of using some form of antibody certification to hold an in-person benefit concert for New York - offering to pay for testing for all those who bought tickets.

Consequently, in ethical terms, it has been argued that immunity certification may fulfil the public health principle of the *least restrictive alternative* - avoiding unnecessary

impositions and restrictions on individuals who are neither at risk nor who pose a risk to others

10. Immunocapital

In order to better understand the benefits and negative consequences of immunity certification, it's worth considering what this might look like in practice. As I mentioned, no such programmes are yet up and running. There are though, historical parallels which can be informative. Perhaps the best described, and most relevant, is that of early 19th century New Orleans, captured in the work of the historian Kathryn Olivarius.

Olivarius describes how newcomers to Louisiana and New Orleans at this time were faced with the threat of yellow fever, at the time thought to be associated with the bad air or "miasma" resulting from the heat and filth of the growing city. Yellow fever was fatal for half of those infected, and was considered a "stranger's disease" strongly associated with "unacclimated" immigrants from the Northern US states and Europe.

11. Acclimation

For these new arrivals, at least those who were white and male, encounters with yellow fever presented both peril and promise. If they survived, it opened up access to what Olivarius terms "immunocapital" - funding and support not available to those who were not acclimated. Life insurance, for example, was cheaper and more readily available to those who had successfully acclimated, as were bank loans. For women in high society Louisiana, expected to raise a family, acclimation was a pre-requisite for marriage.

As a result of these benefits, people were both self-motivated and exhorted in the press to take responsibility for becoming acclimated, coincidentally removing pressure for public health action on the part of city councils.

However, the benefits of 'immunocapital' were only accessible to those already most privileged. In contrast to white immigrants, for whom immunity became a source of capital and power, for black slave residents - who were considered without evidence to be more resistant to yellow fever - acclimation simply increased their value as property, benefitting their owners while often placing them in some of the most dangerous or difficult environments.

The case of New Orleans shows how immunity can become a source of privilege. It also, though, shows the potential for social stratification on the basis of immunity to map on to, and exacerbate existing inequalities and injustice.

12. Back to Covid

Considerations of immunity passports draw into focus a number of concerns as they also map onto existing social and economic faultlines in our society - highlighted by the impact of Covid-19 on black and minority ethnic groups, and the inequalities and forms of discrimination that have resulted in the Black Lives Matter movement.

13. Discrimination

By its nature, stratifying the population based on the existence of an antibody response involves some level of unequal access to goods and services, including in relation to employment. This is not necessarily a bad thing - it may have the advantages I mentioned before.

However, any form of discrimination carries the risk of unfairly affecting some groups or individuals.

For example, it is conceivable that some employers may come to discriminate on the basis of what has been described as 'immunological fitness' - recruiting workers whom they feel are less likely to fall ill, or to pose a risk of infection to other staff or the public. Such an immune-certified workforce might represent an advantage, including to businesses in sectors like tourism, hospitality or in the care sector.

In such circumstances, individual employees' freedoms may be practically restricted as they may feel compelled or coerced to both take a test and to disclose the result. Those on zero hours contracts meanwhile, might find themselves unable to work as a result of testing negative, with only minimal state support provided.

More broadly, there may be an expectation that those engaging in social activities become expected to be able to demonstrate their status - or be considered to be concealing something.

It's also the case that the burden of any such discrimination is not likely to be equally distributed - it's likely to fall on those who are already socially marginalised or disadvantaged. In a context where the effects of Covid-19 are felt disproportionately by

black and minority ethnic communities, or by those with existing health conditions, becoming 'immunoprivileged' does not bear the same risk for all. Indeed, it is also a privilege that is inevitably denied to those who are shielding.

14. Equity

That brings me to a second point, that of equity. Access to antibody testing requires certain resources. We've already seen this in the UK with regards to swab testing - the early 'drive through' testing facilities established to expand testing capacity were often located in out-of-town car parks near major cities, making it difficult for those without cars or living in rural or remote areas to access testing.

In the case of antibody testing, any system that requires individuals to pay, or that is based on employer contributions risks excluding those who are economically disadvantaged or out of work, while those linked to smartphone verification systems - like the examples I showed before may impact the already digitally excluded.

15. Perverse incentives

Third, state or corporate policies supporting immunity certification risk creating perverse incentives. Here there's an important distinction from vaccination certificates, such as that for yellow fever - the *carte jaune* that some countries require for entry . Vaccination certificates create a privilege associated with vaccination, and the increase in demand for vaccination associated with this benefits everyone. Antibody certificates in contrast, do the opposite.

This means that, as for European arrivals in early 19th century New Orleans seeking to acclimate to make their fortune, antibody certification could create a perceived advantage in increasing one's exposure to the coronavirus - both increasing the risk to one's own health, and undermining public health efforts to control spread.

Short of deliberate exposure, linking antibody certification to employment, goods or services also creates an incentive for seronegative individuals to forge or falsify samples or documentation, particularly given the proliferation of certification systems - again, increasing the risk to themselves and the likelihood of population transmission.

16. The elephant in the room

Finally, I want to address the elephant in the room - whether the science of Sars-CoV-2 antibody testing currently supports an immunity passport system.

To date, reviews suggest that antibody testing is hampered by small studies that provide little information about the accuracy of tests outside clinical settings, particularly among people with mild disease or with no symptoms. Although such reviews are, at the moment, out of date almost as fast as they emerge, they suggest that any antibody test would currently have limited value for a certificate programme, particularly given the low overall proportion of the population thought to be infected - presenting the risk of a high rate of false positives and the consequent false reassurance of people who have not, in fact, been exposed to the virus but are told they have been.

17. Immunity

The second problem, highlighted by the World Health Organisation as far back as April, is that we don't know with any certainty what level of immunity, or what type of immunity, is indicated by the presence of antibodies. As Dido Harding put it in a government press conference, we currently know that if you have antibodies, you have antibodies.

This will likely become clearer over the next few months, but at the moment, we risk proceeding - as countries, companies and individuals - as if this is already known. Again, this has risks not only for those who assume they are immune but are not, but also for the wider effort to reduce transmission.

18. Conclusions

In conclusion then,

- Immunity passports are one of a range of scientific and technological approaches being considered and debated by governments and companies as a means of helping establish post-Covid normality
- They may be an ethical way of restoring social and economic freedoms to individuals, and supporting the economy
- However, they present a range of concerns associated with their potential to exacerbate existing inequalities and undermine public health efforts
- Their use is not currently supported by the science, either in terms of the accuracy of testing or the implications for immunity

- This may stall, but not prevent, their introduction by governments, but there may nevertheless be a private market in testing for employers and individuals that may require close attention and potentially regulation