IMMUNITY CERTIFICATION INFRASTRUCTURES AND ETHICS: PRINCIPLES AND STRATEGIES FOR DECISION MAKING

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Immunity certification schemes such as vaccine passports are being advanced by firms and governments around the world. But to date **commentary on the impact on people and groups tends to overlook the effects of technologies across scales**. *This matters because impact at scale is what makes vaccine passports so alluring - promising society-wide benefits at what looks like low financial and political cost. Understood this way, the passport per se is not the issue.*

What's at stake is the creation of a set of infrastructures.

This Rapid Ethics Review help us to understand the values at play in the way immunity certification infrastructures might work. The main contribution of this review is to identify the range of scales at which these infrastructures will work, and a set of questions by which to evaluate ethical and policy issues at these scales.

OVERVIEW

- Policy for COVID-status certification must be underpinned by **clarity about the purpose and scope** of any scheme and its infrastructure.

- The ethical implications of certification schemes look different depending on whether you are focusing on the individual, groups or communities. Policymakers need to consider the **ethical implications at these different scales**.

- At stake are not only issues of freedoms and harms, but the often-unforeseen effects of new and complex data infrastructures

- **Critical to evaluating the ethical concerns** is the question of how long certification infrastructures will be operational, and clear plans for end-of-life decommissioning. There is an argument for some loss of privacy and increased surveillance if it allows us freedoms in a pandemic. But this has to be balanced with a plan to restore privacy and reduce surveillance once the pandemic is over.

- While it will be tempting to reuse the technologies and infrastructure for other purposes afterwards, **without a clear decommissioning plan** (or being open about its potential future uses), there is a risk that decisions about vaccine certificates are decisions about future levels of privacy. This raises a whole new set of ethical concerns.

- It is not sufficient to consider ethical implications only during design and build phases of status schemes. Procedures to ensure **ongoing accountability** for all system-users is critical for good governance.

- **Data flows and interlinkages** will be an integral part of status certification infrastructure that bring together national and international data regulations, individuals' data rights and technical competencies. These need to be designed, tested, and made accountable prior to build.

1. WHY SHOULD IMMUNISATION CERTIFICATION BE A QUESTION OF BUILDING ETHICAL INFRASTRUCTURE?

Immunity certification infrastructures are based on established proof of being vaccinated, or less commonly on satisfying some sort of immunity test. They have three core features:[1]

- The infrastructure contains and conveys health information such as vaccine or immunity status.

- The infrastructure connects the end-user's identity to the certification system, permitting verification by an inspector in a real-world context.

- The infrastructure facilitates the authorisation by that inspector of the link between identity and health status for the purpose of allowing or blocking actions in society.

Proposed certification schemes consist of vast *sociotechnical* systems which include data, hardware, software, people, institutions, rules and regulations (see **Box 1**). **Assessing ethical impact** of these schemes, it is critical to consider overall certification infrastructure rather than end-user apps or digital certificates in isolation.

Successful schemes require these components being assembled quickly, cost effectively and across large scales such as industries and sectors, populations, countries – and across UK jurisdictions and international borders. All these components individually and in combination must **comply with existing institutions** such as **employment law**, **equalities law**, **data law** and GDPR. Each additional infrastructural component and scale increases build-time, cost, complexity, uncertainty and impacts ethical impacts in different ways across multiple scales.

Summary points

- **Assessing ethical impact**, it is critical to consider overall certification infrastructure rather than end-user apps or digital certificates in isolation.

- Successfully launching and managing infrastructure requires more than the rapid development of an app and the building of trust amongst a population.

- Reliability of schemes require both technical excellence and adherence to social norms such as fair and equitable enforcement.

- Additional costs, complexities and uncertainties will have to be balanced against Covid-19 transmission reduction expectations and other benefits.

Box 1. Immunity certificate infrastrucutre - system components

Immunity certification infrastructure consist of the following social and technical elements:

Data such as the vaccination records, identity proxies, health and location data of individuals.

Software such as apps, verification systems, interoperability middleware, biometric systems, testing systems, databases, linkages across multiple databases and multiple jurisdictions, encryption systems.

Hardware and infrastructure such as verification kiosks or scanners, servers and cloud storage, mobile phones, linkages to testing and vaccination procedures.

People, skills and capabilities such as skilled operators, medical experts and their expertise, compliant individuals and populations, regulators, enforcement services such as border control and the police, IT professionals, standards bodies, infrastructure firms, services firms, marketing and public information, democratic engagement and deliberation, legal professionals.

Organisations such as governments, global governance organisations, firms, lobby groups, unions.

Formal and informal institutions such as laws,

2. HOW CAN WE EVALUATE CERTIFICATION INFRASTRUCTURES AT SCALE?

TIME: What are the long-term consequences? Will future generations pay more than current generations? Will future generations face fewer choices as a result of this technology? Is there a risk of 'lock in'?

GLOBE: how does this technology affect the planet? How does it affect geopolitics Which nations does it benefit and which nations lose? Does it bring people together or increase divisions? Does it focus wealth in particular parts of the world? Will it make some nations more, or less, dependent on others?

NATION/SOCIETY: Does this technology reduce or increase inequality? Who benefits? How does it affect democracy? Does it respect national cultures and institutions? Does it allow profit to be moved/enable stateless profit?

SYSTEMS/INSTITUTIONS: Does the technology need particular infrastructure? Does it fit with how we want systems organized? (Local vs. central/levels of authoritarianism/ownership); Number &types of jobs; Access, Fairness, Privacy for whom? Who decides?

GROUPS/COMMUNITIES: Are people brought together or moved apart? Are some groups unfairly benefiting or being stigmatize or dis empowered Are group effects harming individuals' rights?

INDIVIDUAL: Who benefits/loses? Rights, privacy, fairness, access, individual responsibility.

FIGURE 1. **Considering ethical issues and decisions at multiple scales, developed by Smallman[3]**

Proposed schemes operate across different scales, impacting individuals, communities, society, industries and populations and operating within countries and across international borders.[2] These scales are outlined in Figure 1. **The main contribution of this review is a framework by which to evaluate ethical and policy decisions on the impact of immunity certification infrastructures across multiple scales**.

> **Summary points**
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> - Proposed certification infrastructures operate across different scales and must be evaluated in the context of operation across these scales.

3. WHAT ARE THE KEY ETHICAL CHALLENGES FOR INDIVIDUALS, GROUPS AND COMMUNITIES?

Immunity certification infrastructure has the potential to contribute to the regulation of the movements of people within and across countries.[4] People who have been vaccinated are likely to be at least temporarily at lower risk of reinfection. They are less likely to suffer the harmful effects of the virus and less likely to spread the virus to other people[5,6] This is a **compelling ethical argument for removing or reducing restrictions** on the movement of such people.

However, the actual impact of certification infrastructures in terms of benefits and harms will turn on i) **decisions made during the design and build** of specific certification infrastructures in their particular contexts at given scales, and ii) **existing structures and inequalities in society** which influence, and are influenced in turn by these infrastructures.

For example, vaccine hesitancy in the UK is patterning

in particular ways with some black and minority ethnic communities particularly hesitant to receive the jab, despite impressive take-up in other parts of society. Immunity certification schemes could reinforce existing inequalities experienced by these groups and be the source of increased conflict.[7,8,9]

there is an ethical and legal risk of coercion rather than persuasion

There has been some talk of vaccine certificates providing "nudging" incentives to some (young people for example) who would not otherwise get vaccinated although this is not evidenced.[10] Here there is an ethical and legal risk of **coercion rather than persuasion** – particularly if what is at stake is significant, such as employment opportunities. If certification is introduced in part to combat vaccine hesitancy, then the **ethics of coercing** the vaccine hesitant to get the jab rather than the **ethics of persuading** should be considered.[11]

When assessing who benefits from certification infrastructure, **ethical evaluation must address specific contexts of use** for a diversity of users. Community groups, representative groups and trade and industry bodies all have important roles to play in the governance and enforcement of schemes that have the purpose of restricting/liberating individuals' movement. Procedures to give voice to these diverse set of stakeholder values are critical and should be instigated before designs are finished.

Groups are not only policy takers, but also major lobbyists for certification schemes and related policy making. Lobbyists for the travel industry for examples have been major drivers behind calls for schemes – IATA has proposed its own scheme for example.[12] Other special interest groups are likely to seek to influence the design and roll-out of schemes that do get the go ahead.

Summary questions for ethical evaluation and decision making.

- What are the benefits of immunity certification schemes and how are these benefits distributed?

- What principles and values inform the distribution of resources and benefits provided by immunity certification infrastructure?

- Who pays for such schemes, who loses from their creation and are losses justified?

- How do individuals seek redress for harms caused by schemes, whether through unforeseen impacts or operational negligence?

- How can individuals opt out of passport systems once registered and how can they maintain a right of informed refusal?[13]

- Are some groups unfairly benefitting or being stigmatized or disempowered?

- Are group effects harming individuals' rights?

- Do some advocacy groups have more influence on decision making than others and does this influence align with democratic principles?

4. WHAT ARE THE ETHICAL ISSUES IN DESIGNING AND GOVERNING IMMUNISATION CERTIFICATION INFRASTRUCTURES?

Infrastructures of all kinds bring together diverse sets of rules, laws and standards. Significant areas for ethical deliberation are described below while pertinent design issues of existing proposals are listed in **Box 2**.

Creating standards

The technical and procedural rules that govern large scale infrastructures such as Europe's Digital Green Certificates need to be standardised and made

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Box 2. **Example of design issues with some proposed immunity certification schemes**

- The majority of schemes at planning stage, including the European Digital Green Certificates are designed to act as a proof of vaccination,[15] though some indicate antibody status and some act as proof of negative tests. No scheme can be 100% reliable in operation.

- In the UK the NHS App has been suggested as one existing platform on which to build a certification scheme.[16]

- This proposal risks the de-facto burdening of the NHS' public health infrastructure with responsibilities for adjudicating matters of free-movement and public

safety – roles for which the NHS is unsuited to fulfil, especially during an ongoing public health emergency.

- Ethical risks include undermining public values of trust and security in the NHS and conflating issues of public health with individuals' rights and wellbeing in other areas of life.

- Other proposals seek to build systems from scratch. These include the travel lobby groups IATA, and blue-chip tech firms such as IBM.

- It is questionable whether such schemes can be deployed and regulated quickly, cost-effectively and with appropriate accountability structures in place.

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interoperable. These tasks are often contentious because they help decide and operationalise who benefits and who pays for the infrastructure. Therefore, the composition of standards making bodies is a political choice and should be made following principles such as fair representation and democratic decision making. Cooperation between counties and firms is a significant challenge here given existing inequalities in technology access, provision, and influence.

Standardisation may ensure technical verification happens uniformly across time and space. However, standards can only inform status decisions. These decisions will always require human interpretation and enforcement. Standards cannot ensure enforcement that is uniform, fair and appropriate. Other governance mechanisms are required.

Accountability structures

Infrastructures must be designed with their users' needs, rights, health and well-being in mind. They must operate safely and fairly. They must safeguard individual and group privacy while being procedurally transparent. Where these values are absent, it must be clear who is responsible for making decisions and how they will be held to account. Furthermore, **regulators must have access to the data and expertise they need to scrutinize operations and decisions** influenced by certification schemes.

Giving users a say in designing how systems work

Community groups, representative groups and trade and industry bodies all have important roles to play in the design, governance and enforcement of schemes that have the impact of restricting movements. Accountability structures within such systems should be designed in participation with representative users. However, no evidence can be found of how people effected by immunisation certification are contributing to the design or evaluation of systems currently being planned. In the UK the Cabinet Office conducted a rapid expert consultation exercise but did not engage widely or deeply with a broad range of people likely to be affected by such schemes. This risks people being co-opted into systems in which they have had little say in design. Public engagement exercises, or innovation practices such as co-design, co-creation and transdisciplinary research might mitigate these

risks but need to be initiated early in design phases not after the fact.

Further ethical considerations for evaluating certification infrastructure designs

An approach that evaluates the outcomes of immunity certification infrastructure must be evidence driven. But as with mapping complex systems generally, it is not enough to make loose claims about everything being connected to everything else; instead, the nature and the strengths of these connections needs to be explored empirically and evidence produced that justifies policy action.

Issues of interoperability, dataflows and data-linkage must adhere to democratic norms and existing legislation. Ensuring systems operate within existing technical, legal, and data protection frameworks is a must. It will be vital to clarify all the data flows that will be necessary to deliver Covid-certification, and their legal basis, in parallel with policy development.

Certification infrastructures must fit with how we want systems organized. Decisions about whether they are centralised or distributed should be made in collaboration with a representative set of system users.

Immunisation certification infrastructures should contribute to meeting Sustainable Development Goals and similar global programmes.

> **Summary questions for ethical evaluation and decision making**
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> • Are accountability structures clear and built in from the start?
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> • Are a diverse set of stakeholders meaningfully involved in designing and building certification infrastructures?
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> • Are infrastructures clearly regulated and do regulators and other stakeholders have access to the data and decision-making procedures required to effectively scrutinize?
>
> • What kind of design logics will inform certification infrastructures? Will they be centralized or distributed? Will they run on proprietary systems or be open to all?

5. ETHICAL CONSIDERATIONS FOR CERTIFICATION INFRASTRUCTURES TODAY AND INTO THE FUTURE

Most discussions of immunity certificates have taken a short-term view, with a time horizon lasting no more than a year or two. But experience shows that once an infrastructure is in place, it tends to stick around for much longer.

Clarity about the purpose and scope of any scheme is required from the outset. Lack of precision about what the main purpose or purposes will make it much more difficult to have sensible and well-evidenced discussions about, for example, data retention periods, data-linkage permissions, and decommissioning strategies.

Design and build decisions on COVID-19 certification today could lock-in features and exclusions for years to come. It is extremely difficult to change infrastructures once built. However, infrastructures are especially susceptible to scope creep – where new uses are found for systems that have been rolled-out.

This has implications for expanding budgets as well as future distributions of benefits, costs and harms. For example, systems for immune certification could easily be expanded to include other forms of personal health data, such as mental-health records and genetic-test results. Today's certification schemes could become the all-encompassing biological passports of tomorrow bypassing appropriate democratic debate.

Ethical evaluations of immunity certification systems must acknowledge uncertainty, risk and the ways in which technology changes and adapts in use, for example through responsible use of digital data to tackle COVID-19.[14]

Summary questions for ethical decision making and evaluation

- What are the long-term consequences of vaccine passports?

- Will future generations pay more than the public right now?

- How might decisions made today on vaccine passports create lock-in and path dependence to unsustainable or unjust systems?

- What decisions and features of existing and evolving systems need to be re-evaluated in the context of the pandemic response?

- Are immunity certification systems normalising health status surveillance by creating long-term infrastructure in response to a time-bounded crisis?

Box 3. **How yesterday's design decisions influnce the present and future**

Ethical evaluations that focus only on the near future overlook how previous decisions and system reconfigurations have influenced the present. This is called lock-in or path dependence.

The problem is that technologies that were deemed ethically appropriate in the past may create new harms given changed circumstances and new uses.

Example: Lock-in and the NHS App

iProov are a biometric technology firm that supply a range of software such as facial recognition to the

NHS App. The choice of these technologies for use in the NHS App was predicated on a technology roadmap designed before the pandemic. It may be that the iProov technologies will continue to be used as the scope of the NHS App is expanded. Yet the selection criteria used to assess iProov's capabilities, benefits and risks, is dramatically different from criteria that would be expected of an immunity certification system. Should the NHS App be used as an immunity certification system, technology subsystems like iProov will need to be re-evaluated to meet new criteria.

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About the UK Pandemic Ethics Accelerator

The UK Ethics Accelerator is a UKRI/AHRC-funded initiative that aims to bring UK ethics research expertise to bear on the multiple, ongoing ethical challenges arising during a pandemic emergency. We provide rapid evidence, guidance, and critical analysis to decision-makers across science, medicine, government, and public health. We also facilitate public stakeholder deliberation around key ethical challenges.