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Taking the UK's Testing Strategy to the Next Level

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Foreword

With a safe vaccine still some way off, mass testing – meaning testing the majority of the population, using all possible means at our disposal – remains the only way to restore confidence and allow the UK to live safely alongside Covid-19. This means an evolution in the government’s testing strategy, from one based on targeted testing to one that opens up testing to as many people as possible, as often as possible.

It is the key to reviving our economy and getting the country back to work.

We are therefore asking the government to make establishing a mass-testing regime its core objective.

This means evolving its existing testing strategy from one targeted on those with symptoms to a system that sees people tested often and easily. It is no easy ask. We ourselves are experienced in the challenges of governing, and Covid-19 is the most disruptive event of our lifetimes. To have gone from minimal lab-based testing to an infrastructure that has capacity to test more than 300,000 people per day should be rightly celebrated. The government and Britain’s diagnostics industry deserve much credit for this.

Mass testing is the natural next step, but it requires a giant leap in the focus, resources and support demanded of government. These are set out across five pillars in this paper, which also serves as a plan for boosting testing capacity, including incentivising and onboarding rapid on-the-spot tests. This evolution in testing will not happen overnight and nor should we expect it to. Regular testing should be steadily introduced to those sectors identified as a priority by government, including education and social care, while employers should be supported to participate in mass testing. The need for mass testing has been set out clearly by figures such as Anthony Costello, Paul Romer and Sir Patrick Vallance, as well by organisations like the WHO and today, the CBI.

We know there is a delicate balance to be struck between health and economic concerns. We also know that the two are inextricably linked: an economy in freefall causes immense physical and mental harm and the uncertainty of lockdowns will lead to deep and lasting economic damage. Having the confidence to return to work and for consumers to interact with businesses is now a must, but it can only be achieved by learning to live alongside the virus. Short of a safe vaccine, mass testing is the only way to realise this.

We therefore ask the government to adopt mass testing as its objective and the organisations below remain on hand to provide advice, guidance and support in turning this unprecedented ambition into a reality.

Signed

Tony Blair

William Hague

Jeremy Hunt

Overview

Up to 70 per cent of Covid-19 cases are likely asymptomatic.¹ The UK, along with much of the world, faces the prospect of a second wave of the virus.

These facts urgently require an evolution in the UK's testing strategy from one that focuses testing on those with symptoms to a system that tests as many people as possible, as often as possible. We call this mass testing.

Taking the UK's testing strategy to the next level through a move to mass testing is critical if we're to live alongside the virus. It is no understatement to say that the future of our health-care infrastructure, of our primary, secondary and tertiary education systems, and of our businesses depends on this evolution in testing taking place.

Without giving people confidence to be fully economically active, the country will remain stuck in a limbo of neither fully open nor fully closed – and many organisations wouldn't survive a second lockdown. The economic ramifications of such an eventuality would be catastrophic.

Mass testing is the only way to prevent this as we head into autumn.

The UK should commit to an objective of rolling out mass testing before the end of 2020.

Merely stating an objective is not a solution, but it is an important step in helping to organise and focus resources, energy and effort.

To date, the country has not set itself or industry the right objective on testing: moving to a posture of testing as many people as possible, as often as possible.

Mass testing should become a collective endeavour, stimulating British innovation and inspiring national leadership.

Those involved and referenced in this report are clear they want to help. They are ready to be part of creating the mass-testing infrastructure the UK needs.

In turn, this coalition calls on the government to:

1. Clearly and publicly set mass testing as the shared objective.
2. Give focus and resources to turn an objective of mass testing into a reality.
3. Bring in the right team to support government, including those with experience in testing, procurement, technology and logistics.

Delivery of a mass-testing strategy:

We propose a phased approach to rolling out mass testing, starting with sectors and organisations identified as strategically important and/or where it is relatively easy to administer a large volume of tests, regularly, at scale.

These include:

- Social care
- Emergency services
- Transport workers
- Education, including schools, colleges and universities
- Large employers
- SMEs with occupational-health teams
- Professional sports
- Travel, including at ports of entry

We would be building towards the regular, ongoing testing of every person in the country.

We define a mass-testing regime as one that includes regular, ongoing Covid-19 testing of all citizens. The purpose of such a regime is to identify asymptomatic cases and break the chains of infection.

This testing would be conducted in a variety of settings: at home, at work, at transport hubs and at a diverse range of other testing sites. The testing regime would make use of rapid point-of-use tests – both antigen and antibody.

These results would eventually feed into a health passport that would provide evidence of an individual's Covid-19 status at any given time.

Towards a Mass-Testing Strategy

A mass-testing strategy would consist of five newly constituted pillars:

Pillar One: Lab-based tests

Continuing to expand lab-based testing capacity by maximising all available lab-space.

Pillar Two: Non-lab-based tests

Bringing online and scaling existing on-the-spot antigen and antibody tests and building on successes such as those from DnaNudge and others.

Pillar Three: The ecosystem of testing suppliers

Shifting from using a small number of testing providers to utilising a constellation of testing suppliers, big and small, providing access to funding and patient samples, and fast-tracking regulation.

Pillar Four: The “moonshots”

Identifying the types of tests that do not exist to the scale or standard needed, but which will be essential to a mass-testing regime. These should be supported by access to funding, patient samples, lab space and coordination. Such moonshots will include:

1. Low-cost, rapid, on-the-spot antigen tests that tell if someone has an active Covid-19 infection.
2. Low-cost, rapid antibody tests that identify if someone has had Covid-19 and currently has protective antibodies.
3. Low-cost, rapid T-cell tests that identify if someone has the protective T-cells present.

Pillar Five: The administering, communication and coordination of mass testing

- **Administering:** Done through local communities, including schools, GPs and care homes, employers and existing Public Health England (PHE) testing sites, supported by a digital infrastructure.
- **Communication:** This requires a specific communication campaign that makes it clear how mass testing works.
- **Coordination:** Results from different testing suppliers (the ecosystem) feed into a single database, ultimately building to a health passport for every individual.

Why an objective of mass testing must sit at the heart of the country’s Covid-19 response:

The present system of testing is inadequate because it misses asymptomatic infections, which we know likely represent the majority of cases. As yet there is no way we can eradicate the disease; therefore we have to contain it and live with it.

Spikes and a resurgence are inevitable if we don't identify and isolate asymptomatic carriers – as the experience from around the world shows – and people do not have confidence at present to go back to normal even if allowed to do so. Many businesses and organisations cannot function effectively unless people can be regularly tested.

Asymptomatic cases:

Different countries have reported varying proportions of asymptomatic people among those who test positive. For example, in Italy, as many as 73.9 per cent of Covid-positive people younger than 60 years of age were asymptomatic. ²

In another narrative review, about 40 to 45 per cent of cases have been estimated to be asymptomatic infections. ³ This was based on testing of more than 45,000 people from 16 different studies.

Sir John Bell, Regius professor of medicine at Oxford University, told MPs recently that mass testing is vital, since ONS figures suggesting that 70 per cent of cases were asymptomatic were “robust”. ⁴

The burden of asymptomatic infections is therefore high and must be fully dealt with through the right regime of mass testing.

The key benefit of proactive mass testing of asymptomatic people and isolation of positive cases is that this would minimise the need for a general lockdown with its associated huge negative economic consequences. With the increasing availability of low-cost mass-testing capabilities, the case for such mass testing cannot be stronger.

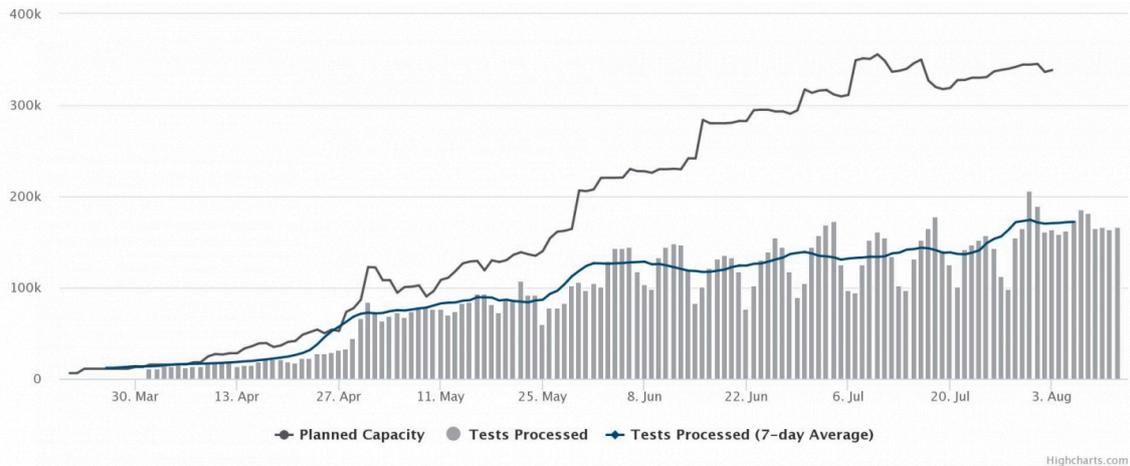
Pillar One: Lab-based tests

The UK has made excellent strides in boosting lab-based testing capacity and this remains an important pillar of a mass-testing strategy. As it stands, the country has capacity for 338,413 tests per day but conducts just 166,207 ⁵ – meaning that over 50 per cent of lab-based capacity goes unused. This is the direct result of a strategy that is built around symptom-based testing.

While the gold-standard of mass testing would require even more tests coming online (these would be established by increasing lab-based testing capacity in Pillar One, and bringing tests in Pillars Two and Three and, eventually, Pillar Four onboard), there is capacity now to conduct mass testing in a target sector such as care homes or schools.

To take the UK's testing strategy to the next level we must immediately allocate this latent testing capacity to conduct mass testing in priority sectors.

Figure 1 – UK testing capacity versus number of tests done



Increasing Capacity

Several approaches can be employed to increase testing capacity. Lab-based testing can be further expanded with faster RT-PCR tests that can produce results within 90 minutes. This can significantly increase the throughput while decreasing the testing cost.

Additionally, with technologies such as RT-LAMP, the instrumentation and personnel requirements are lower than with RT-PCR, allowing even more cost-effective, scalable testing to be brought onstream that can be performed at point-of-care rather than requiring the capabilities and expertise of central laboratories.

Pooling

Inspired by the Covid-19 Testing Network,⁶ this approach involves collecting samples from patients, pooling a tenth of each sample in the lab, and then testing this compilation sample. If the results come back negative, we can conclude there were ten negative samples; if the sample comes back positive, then the ten original samples are retested to determine which is positive. It works particularly effectively in mass testing where the number of positives is likely to be low (currently this is one in 1,700) and most tests are confirming a patient's negative status.

By pooling samples we can increase, overnight, testing by three- to fivefold. Over time, with automation and more effective sample collection (onsite and using saliva), this method could increase current lab-based capacity by ten times.

For example, in one testing scenario, at a 30-minute turnaround time, with 4:1 pooling and with 10 PCR machines, throughput can be increased by as much as 160,000 tests per day.⁷ This could be a highly scalable, low-cost strategy that would allow mass testing.

Pillar Two: Non-lab-based tests

The UK must scale up on-the-spot antigen and antibody testing in the second pillar of a mass-testing strategy. There are a number of British-based suppliers who have developed tests that are now being supplied abroad. These should be fast-tracked through regulatory bodies.

Two Types of Test

- **Antibody testing:** For public-health screening purposes, antibody tests have an important role to play for surveillance as they provide a better measure of disease activity in the population. For example, antibody tests can help to identify those in whom RT-PCR is negative because they have been previously exposed. Despite the concerns of lower sensitivity during the early phase of infection, the test is much more accurate in asymptomatic people who have had past infection or are in the late phase of infection. For example, evaluations by Public Health England (PHE) concluded that two antibody tests by Roche and Abbott each had a specificity of 100 per cent; sensitivity, for samples taken at least 14 days since the onset of symptoms, stood at 93.9 per cent for the Abbott test and 87.0 per cent for the Roche test. ⁸ Identifying these people is important as at least a proportion of them are likely to be immune and can help to facilitate economic activity.
- **Antigen testing:** Rapid antigen tests are useful as they can be performed in point-of-care settings, rather than requiring central lab facilities. More importantly, the test results can be obtained in 15 minutes using readily available instrumentation. For example, 25,000 BD Veritor instruments are already being used across the United States and the rapid antigen tests can be performed quickly. While the test has 100 per cent specificity, sensitivity is lower than that of RT-PCR test at 84 per cent. ⁹ While this sensitivity could be lower for clinical diagnostic purposes, for promoting public health using mass screening, this performance is quite reasonable. In fact, the biggest limitation in not being able to control the pandemic is not slightly lower sensitivity, but rather the ability to rapidly scale up the testing. Thus, as the rapid antigen testing lends itself to mass scaling easily, this technology seems to be a key element of a mass-screening strategy.

Accuracy fallacy

While questions remain about the accuracy of rapid tests, we believe that a number of tests are accurate enough for public use. We set these out in our recent paper "[Pressing Go on Mass Testing](#)". In any case, we recommend putting in place a system of double-checking rapid tests through the use of highly accurate lab tests.

- **Antigen Testing – Reducing False Positives and Catching Asymptomatic False Negatives:** Anyone presenting with suspected Covid-19 symptoms is currently offered a PCR swab test and in the case of on-the-spot antigen testing, we recommend a positive result for Covid-19 be followed up with a lab-based PCR test for confirmation. This would maximise the chances of correctly identifying a positive case and would be feasible, especially given the relatively low prevalence of Covid-19. The

gap in this approach for mass testing is asymptomatic individuals who test negative as part of the regime but do in fact have the virus, i.e. they have a false negative – so they would not then qualify for an affirmative test. Such false-negative cases, however, are not covered under the existing government strategy in any case and by regularly testing those without symptoms, we maximise the chances of isolating transmitters early in their infection.

- **Antibody Testing – Reducing False Positives:** We apply the same recommendations to on-the-spot rapid antibody testing. Any positive case would be confirmed using the highly accurate lab-based ELISA test. The gap here arises where someone could receive a negative result but actually has antibodies. In such a case no risk arises – the person likely has short- to medium-term immunity but isn't aware of it. By combining rapid and lab-based testing there is a lower risk than arises in the current government strategy.

Pillar Three: The ecosystem of testing suppliers

The UK should shift from a centralised supply chain of diagnostics to one that incorporates the widest possible constellation of viable smaller and medium-sized suppliers.

As part of this kind of mass-testing regime, the UK will require millions of **rapid antigen tests** that are easily administrable at the point of care, outside of a lab. This means that when someone goes to work or enters the country, for instance, they would be subject to a test that determines if they have Covid-19. These tests would need to be used regularly, and longitudinal data would need to be collected to monitor progression of an individual who initially tests negative.

Complementing this would be **rapid antibody tests**. Detecting if someone has had the virus, these tests would play a specific role as part of a mass-testing strategy. Such testing will give us the best possible picture of prevalence of the virus, as well as identifying those with a level of immunity. Lab-based tests would still be used to validate those who have the antibodies to Covid-19 confirmed by rapid tests and therefore have some presumed immunity to the virus.

Both tests would be supplementary to the existing regime, enabling coverage of a broader population, and at greater pace, particularly of those without symptoms. However, in both cases the **results could be confirmed** by highly accurate NHS tests – either a PCR swab or saliva test, or the highly specific lab-based serology test.

What Rapid Tests Are Out There Now?

There is a wide range of rapid tests now on the market. These include rapid antigen tests and rapid antibody tests. Alongside these are LAMP tests and also rapid PCR tests, like DnaNudge.

- **DnaNudge:** Earlier this month the UK placed a £161 million order with DnaNudge for the supply of 5.8 million rapid Covid-19 test kits. The government announced in early August that 5,000 Nudgebox machines will be rolled out in NHS hospitals. The machines are able to process up to 15 tests on-the-spot each day. The rapid PCR tests do not need a laboratory and will be rolled out in

hospitals from September. The test provides a result within 90 minutes. Trials comparing COVID Nudge against several NHS laboratory results indicated 98 per cent sensitivity and 100 per cent specificity.

- **Rapid Antigen Tests:** According to the website FindDX, which the European Centre for Disease Prevention and Control refers to, 22 rapid antigen tests have been commercialised (four are currently designated as research-use only). ¹⁰

In the US, BD (Becton, Dickinson and Company), a medical technology company, recently announced that the Food and Drug Administration (FDA) had granted them an Emergency Use Authorisation (EUA) for a rapid point-of-care antigen SARS-CoV-2 diagnostic test. The test delivers a result in 15 minutes and is easy to use and portable. Clinical studies performed at more than 20 sites across the US demonstrated that the test is capable of achieving 84 per cent sensitivity and 100 per cent specificity. ¹¹

Quidel, the maker of the rapid antigen test approved in the US, says its test has demonstrated a clinical sensitivity of 80 per cent and specificity of 100 per cent when compared with an EUA molecular device. ¹² The test delivers a result in 15 to 30 minutes and uses a nasopharyngeal swab. ¹³

- **Rapid Antibody Tests:** FindDX then lists 192 commercialised rapid antibody tests. ¹⁴ The query the government has raised on these tests is around their accuracy. From our conversations with experts and testing suppliers, we believe a range of these tests, including a number made within the UK, are accurate enough for population-level testing. A range of those under development in the UK were included in our paper, *"Pressing Go on Mass Testing"*.
- **LAMP Testing:** Progress has been made in recent weeks on developing LAMP (loop-mediated isothermal amplification) tests. These tests work by turning plate readers, the backbone of instruments in every molecular biology lab in the UK, into diagnostic tools.

In May, the government announced a trial in Hampshire using a point-of-care reader by Optigene. Despite misreporting of it being a rapid antigen test, the recent trial is for a LAMP test. ¹⁵ The test has been misreported as giving a 20-minute result. A high viral load could return a positive result within 20 minutes, but the entire process requires a full LAMP reaction – which takes about an hour – to confirm negatives. The trial has reportedly been considered successful in clinical settings and the test is now being used in some A&E departments, GP testing hubs and care homes.

The UK government has also announced it will be deploying Oxford Nanopore's LamPORE assay, which uses LAMP to amplify viral nucleic acids. The test uses a palm-sized device to identify Covid-19 sequences by running amplified DNA through a protein nanopore. The government has placed an initial order of 450,000 tests. ¹⁶

UAE-based Group 42 (G42), an AI and cloud-computing company, announced in June that it was working on a "population-scale technology" using an end-to-end solution to rapidly and accurately

detect Covid-19. G42 has been working in partnership with Oxford Nanopore to develop an “ultra-high parallel processing capacity ... this innovation uses the LamPORE assay, which is based on the LAMP technique and Oxford Nanopore’s rapid sequencing platform, in combination with the high-throughput automation, sample processing and reporting workflows developed by G42.”¹⁷

HiberGene Diagnostics recently announced that their new fast molecular Covid-19 test had received CE marking. This followed a clinical evaluation at a private hospital in Dublin. The project received a grant of €930,000 from Horizon 2020, the EU programme for research and innovation. The test uses a simple sample preparation protocol and has performed well with high to moderate viral loads. The portable LAMP PCR test can deliver positive results within 30 minutes on average, negative results within 60 minutes.¹⁸

Testing based on loop-mediated isothermal amplification – while not uncomplicated to scale – and other molecular platforms have the capacity to also unlock hundreds of thousands of tests per day. The key to unlocking this capacity is expediting regulatory approval for a wider range of testing technologies, particularly those that draw on different reagent and equipment supply chains.

Pillar Four: The “moonshots”

A challenge for the government is that there are tests we may need that don’t exist yet – and which certainly don’t exist at scale. This should not serve to dissuade but rather to inspire. In parallel to increasing lab capacity in Pillar One, and boosting tests across Pillars Two and Three, the UK should incentivise innovation in diagnostics that answer strategic problems by offering suppliers funding, fast-track validation and access to patient samples. These problems should be publicly stated with research and evidence being made available. Examples may include the development of a T-Cell test, a £1 rapid antigen test or a less invasive diagnostic for small children or those in a care-home setting.

Example Moonshot: Immunity

Immunity to Covid-19 is complex and we are still in the process of understanding it fully. Thus, while antibodies can be detected in people who have been exposed to Covid-19, in a cross-sectional study, about 60 per cent of people had protective, neutralising antibodies.¹⁹ Development of rapid antibody tests that can specifically identify protective antibodies (as opposed to the most mainstream antibody tests that indicate exposure, but not necessarily protective immunity) could be a key moonshot approach.²⁰

Similarly, T-cells are key elements of protective immunity against Covid-19.²¹ A test to rapidly and accurately detect protective T-cells would be valuable. In addition to identifying who has protective immunity, T-cell testing can also be used for figuring out robustness of response to vaccination.

Overall, as moonshot approaches, new developments such as rapid protective antibody and rapid T-cell testing can be another key pillar.

Innovation Bonds

In addition to supporting providers of innovative tests with expedited validation and access to patient samples, the UK should allocate a specific fund for advance purchase of mass tests. This could be done in partnership with other countries, or the UK could take this approach alone. It was an idea first propagated by Sir Ronald Cohen. ²²

Building on the advance market commitments (AMCs) successfully used to supply pneumococcal vaccines in 2009, and drawing on the principles of impact investment, investors would be incentivised to finance and support the development and manufacturing of effective tests, with their investment effectively guaranteed by the UK government.

Demand would be established through a government contract that includes pre-agreed prices. The contract would incentivise improvement in the elements of tests that are key to the UK's mass-testing strategy, for example around the speed of antigen tests and the accuracy of antibody tests. In this model, the government would commit to purchase all tests produced at the prices agreed, within agreed maximum quantities and time frames.

Sir Ronald Cohen calls for the tests to be funded by government-created *Covid-19 Innovation Impact Bonds*. These bonds would be guaranteed by the government(s) at the time they sign a purchase contract for the delivery of tests. The approach has the added benefit of providing economic stimulus as young and established companies engage deeply in efforts to solve the crisis.

Given that lockdown is estimated to cost the UK economy £2.4 billion per day, ²³ the *Covid-19 Innovation Impact Bonds* would actually save the country money by expediting the speed at which we can return to and remain in an active economy. Even if it saved just two days of lockdown, the bonds could cover the costs of every single person being tested with both a rapid antigen and antibody test priced at £30 each. As set out in previous papers, there are tests already available well below this amount.

Pillar Five: The administering, communication and coordination of mass testing

The development of tests across Pillars One through Four is only part of the challenge confronting the country. There will need to be close collaboration with local communities to organise testing and the collection and communication of results. This would be supported by a digital infrastructure that means any interaction with the mass-testing system would be the same regardless of the type of test used. Eventually, everything would ladder up to a health passport that means a citizen could be confident in their Covid-19 status at any given time.

The Role of Local Communities

The physical infrastructure needed to deliver mass testing is still not in place. Increased testing capacity coincided with reducing transmission rates. It is not clear that our existing infrastructure can cope with the possibility of increased transmission rates later in the year, let alone the asymptomatic testing which is required as part of a mass-testing regime. As set out above, the UK needs to make use of all the technology available to increase capacity. It also needs to enhance the infrastructure that enables access to testing, including:

- **Home testing:** Theoretically there is unlimited capacity for these tests, but the logistics of getting tests to people's homes means they are currently running at a much higher unit cost. Scaling this method will become far more viable once rapid antigen tests come online, which are cheaper to use and require less transportation.
- **Mobile testing centres:** To generate the coverage required for mass testing, far more community-based testing centres are required. Working in partnership with local agencies these could be easily established using existing infrastructure such as polling stations.
- **Point-of-interaction testing:** Once rapid tests are online, this requires working with organisations such as transport companies and venues for high-volume events (sports, music, theatre, conference) to distribute tests. The use of testing in the English Premier League is an example of this being effective.
- **Flexible infrastructure:** We have seen targeted increases in testing capacity in response to local outbreaks, for example in Leicester and Blackburn. However, this capacity has been predominantly used to test those who have symptoms. Case studies from places such as Gütersloh and Hong Kong show how governments have responded to outbreaks with broader testing of the local population to get ahead of the spread of the virus. Government needs to have the flexibility to ramp up greater testing capacity in a locality at pace.

Towards a Health Passport

While most of the debate about suppressing the virus has focused on mass testing and contact tracing, these measures only come into force after an infection. This leaves many high-risk or close-proximity spaces, which should only be accessible to recovered or uninfected people, exposed. This is the role for digital identity.

In the UK, identity has long been a politically fraught issue. But Covid-19 presents a use case that is fast racing ahead of policy. Care homes, airports and other settings need a way of checking that everyone who enters is safe to do so. Failing to meet this need will only lead to abuses of power and loss of privacy. It is far better, for example, for border control or other gatekeepers to scan a secure QR code issued by a verified health authority than to probe individuals' entire medical history before letting them through.

As we have set out elsewhere, government must therefore ensure that any rapid mass-testing regime also confers a mobility credential: a biometrically secured digital code (e.g. a QR code) stored on a person’s phone. Individuals would then present this code when entering specific settings. Different credentials would be issued depending on the type of test received, in turn conferring different privileges on recipients:

Table 1 – Mobility credentials generated by Covid-19 tests

Basis for credential	Permits travel + access to settings	Further testing and tracing
Lab-based, positive antibody test	Yes, at least medium term, possibly permanent	Exempt, at least medium term
Point-of-use, negative antigen test	Yes, temporary	Still participates

If the lab-based credential is like a passport, the point-of-use credential is more like a visa. This helps to avoid retesting people unnecessarily several times a day, such as when coming and going from an office, without exempting them permanently. It would be for authorities to set out when credentials expire (e.g. over time, or after visiting multiple locations), but a digital system allows for this flexibility in a way that a paper-based system could not.

Some have questioned whether governments should hold off on moving forward with mobility credentials until there is both a credible means of testing for immunity and proof that it is long-lasting and generalisable. ²⁴ But the different types of credentials highlight that the fundamental use case is to assess who can travel or access certain settings, not who is immune *per se*. If antibody tests don’t work, or governments can’t reach the necessary capacity to test at scale, rapid antigen testing can at least plug some of the gap and change the risk calculus for navigating the new normal. A digital credential could also be issued to all key workers, if authorities wished, or generated after vaccination, in time.

Key Sectors for Mass Testing

There are numerous sectors where mass testing could be rolled out now. Below are some examples which could be used if the UK is seeking a pilot sector to use the latent 50 per cent testing capacity available at the moment.

Universities

Our recommendation of a mass-testing model is easily applied to universities and this group presents an ideal pilot. Focusing on halls of residence, students could be tested weekly from September onwards. Given their ages – like those involved in the English Premier League’s successful testing programme, see more on this below – students are more likely than other groups to be asymptomatic carriers of Covid-19. Moreover, this group is digitally native and would be comfortable using a health passport, akin to that used by players and staff in football. Universities could contribute to the cost of testing – alongside private providers of halls of residence – and a system could be established that meant students could return safely and securely in September, while addressing the legitimate concern from local communities that this mobile group contributes to outbreaks in the areas they’re moving to.

To do this wholesale among students living in university-maintained and private halls of residence would require 510,000 tests.²⁵ The government’s current testing capacity should prioritise mass testing of key groups (see above) and the test, track and isolate system, but with leadership – alongside the adoption of innovative tests and lab-efficiency measures, such as pooled testing – this additional capacity is well within reach. This is especially so given the co-location of labs and university campuses.

Adopting this approach would give students the confidence to fully participate in university life while also signalling to other sectors the possibilities of mass testing.

Care Homes

In the midst of lockdown, a number of community transmissions could be traced back to care homes and the key workers within these environments.²⁶ Many were asymptomatic and therefore weren’t eligible for testing. Post-lockdown, care-home outbreaks have been significantly reduced thanks to enhanced shielding measures and effective isolation from the outside world. Understandably – and for the mental wellbeing of carers and staff – this is changing at pace and care homes will need to return to some level of normality.

Moving forward, care-home residents, staff and selected visitors could be tested regularly. This is particularly important for workers, who often belong to a demographic that over-indexes on new cases post-lockdown – according to recent data from the government’s testing regime, women aged 50 to 59 account for 12 per cent of all positive cases outside of hospitals.²⁷ Adopting a mass-testing approach would allow staff and visitors to enter or leave the care-home environment with relative assuredness

around their infection status. Regular testing would reduce the exposure of anyone unfortunate enough to catch Covid-19 and would make tracing the source of infections much easier.

Schools

As we have set out in our previous paper "[Back in September: A Test for Our Schools](#)", mass testing would play an important role in restoring confidence for parents, teachers and pupils to fully return to school in September while also controlling potential future outbreaks. Both issues warrant such an intervention, as the fear is real ²⁸ and, since limited reopening began, schools have contributed to post-lockdown outbreaks. ²⁹

By testing the entire pupil population of 2,000 schools over a three-week period, we can build a sufficient dataset to confidently designate "super-spreader setting" status by type and location of school. For example, rural primary schools may be risk-free while inner-city secondary schools could be revealed as hotspots for virus transmission. Those confirmed as super-spreader settings would qualify for ongoing, twice-weekly testing for all persons within the setting to contain outbreaks and provide reassurance. Disproval of a school's status as a super-spreader setting would – by its very nature – serve as a confidence boost for a return to school. Regular monitoring would offer ongoing reassurance should the situation change.

Employers

Employers could introduce regular, ongoing testing for their employees, either through a local consortium or, if they are of sufficient size with adequate resources, on-site. This approach mirrors that of the Premier League and others, and would also serve as a useful tributary to the NHS Test and Trace system, introducing testing for a broad group of people. We have seen this adopted among large, global employers. One company, Tech Mahindra, ³⁰ a large India-based technology company with 125,236 employees, has introduced an individual risk score that uses AI to pull on different data sources and combines them with test results, allowing employees to know their Covid-19 risk and make informed decisions.

The Role of Occupational Health-Care Providers

The occupational-health sector holds close relationships with many employers and is leveraging its expertise to support employers to adapt their operating models in response to Covid-19. In the absence of mass testing, many employers are seeking support with their own testing regimes.

Health Management, one of the UK's leading occupational-health providers, is supporting several clients across different sectors with large-scale employee testing, including:

- Banking: All staff of a major City bank have been offered one-off ELISA antibody testing, which

Health Management are undertaking.

- **Broadcasting:** As TV production schedules have restarted, the company is undertaking PCR testing on a weekly basis to crew and cast members as they move around the country to different filming sites.
- **Manufacturing:** A Health Management client has switched production to manufacture PPE garments for the NHS. They provide with cause PCR testing to any contacts of a suspected individual to prevent the production line from closure.

However, the data protocols mean much of this work currently takes place in isolation from the wider government track and trace effort. Antibody test results, for example, are reported to the employee/ employer, but there is no link in to national and local government. All PCR test results are reported to Public Health England (PHE) via Health Management's laboratory to be included in national reporting. Positive results are followed up by the test and trace programme.

Occupational-health providers are an example of the possible infrastructure government could draw on to pursue an employer-led testing strategy. The sector covers around half of the UK workforce, with 92 per cent of large employers having existing relations with providers.

Lessons From Elsewhere

Britain would be the first country to adopt a nationwide mass-testing strategy. However, since lockdowns have lifted, there have been several examples that give some indication as to how the approach could work.

Germany

Germany's testing strategy is overseen by the Robert Koch Institute (RKI). Germany developed one of the first specific tests for Covid-19 in January. This enabled the country to quickly put in place a large-scale testing capacity. A key part of the country's success has been the devolved responsibility for testing, enabling their large number of high-quality labs to be brought onstream quickly to help. For the week ending 2 August, 161 labs in Germany reported having tested 573,802 samples. The country has been testing more 300,000 samples per week since the week ending 22 March (at that point via 152 labs).

Of the devolved testing regime, Bavaria is of particular note.

Bavaria

The German state will now be offering Covid-19 tests to all residents, free of charge and regardless of symptoms.³¹ People can be tested as many times as they wish. This is a divergence from the official recommendations of the Robert Koch Institute for German states to focus testing on those with symptoms.

While Bavaria's approach aligns with the objective our paper calls for, we don't agree that it should be implemented at this stage in a state's testing capacity lifecycle. One of the challenges for Bavaria is that can only do 20,000 tests a day but has a population of around 13 million. This will undermine mass testing as clearly not everyone who wants a test will get one.

It does seem the first step in a strategic shift, however. The move has been followed by:

- Calls from the Bavarian State Premier, Markus Söder, for Germany to roll out mass testing across the board
- Bavaria announcing testing at motorways and train stations³²
- All 16 German states agreeing to offer free coronavirus tests to all returning travellers – but stopping short of making the tests mandatory (Soder wants these made compulsory)

Hong Kong

Mass testing all in a specific group regardless of symptoms is proving effective in Hong Kong. Since reopening, the country has faced a crisis of confidence among consumers who fear contracting the virus if they were to return to enclosed spaces such as restaurants. Recognising this barrier to the sector fully reviving post-lockdown, the Hong Kong authorities commissioned Prenetics³³ – testing suppliers to the English Premier League – to conduct tests on every single worker in every single restaurant.

Those administering the tests were given a list of every restaurant in the country, with a bar code for each. Saliva collection tests were then delivered to each restaurant, where workers were required to complete a quick pre-registration before being educated on sample collection. Using saliva tests made this much easier.

Once a restaurant's workers had all been tested, the restaurant then qualified for a government-issued sticker that could appear in the window informing potential customers that everyone on the premise had been tested and was Covid-free. This serves as a huge confidence boost to patrons.

In total, the project involves testing 200,000 workers across 16,000 restaurants. At the time of writing, the work is ongoing but it is all due to take place within a two-week period and there are plans afoot for testing to become a routine procedure.

South Korea

There are also lessons to be learned from South Korea's response to the virus. The country managed to flatten its curve quite quickly, without stringent lockdown measures seen elsewhere in the world. South Korea has been particularly successful in putting in place the right testing strategy. The country built hundreds of innovative screening clinics, while also working closely with the private sector to ensure the required number of tests have been available. During the crisis around 600 testing centres were established, with capacity reaching 15,000-20,000 tests per day.³⁴

The English Premier League

The English Premier League (EPL) is a prime example of how mass testing can be deployed to remove the threat of transmissions from a specified group. Their approach, scaled, could hold the key to the UK learning to live with Covid-19 and removing the threat posed by non-symptomatic spreaders, who have been identified as a major source of outbreaks and transmissions post-lockdown.

By acknowledging the role of asymptomatic spreaders early on – a demographic that footballers, given their age, are likely to belong to – the EPL demonstrated excellent foresight in adopting a mass-testing strategy. This involved systemic, twice-weekly testing of every player and staff member across all 20 clubs, along with officials and others involved in the sport. It is estimated that this equates to 40,000 tests in total since the season's restart.

The Premier League worked directly with Project Screen by Circle, a consortium of industry experts led by Prenetics, together with the University of Birmingham, The Doctors Laboratory and support from delivery company Stuart. They set up sample-collection stands at clubs' training grounds and offered home testing to those with symptoms and officials. Following a test, results were uploaded within hours to a digital health passport which – assuming a negative result – provide the holder with access to stadiums on matchdays and other safe zones. Any person testing positive self-isolated for two weeks.

Of the approximately 40,000 tests completed, there was a positive rate of less than 0.12 per cent.³⁵ The process demonstrates a remarkable containment of cases from the EPL. This number could have been significantly higher if asymptomatic carriers had not been identified and been exposed to the many interactions of a Premier League footballer, on and off the pitch.

We recommend that this approach of testing a specified group is adopted in other settings, including but not limited to sports. Given the economic benefits of reopening and epidemiological benefits of mass testing, along with the opportunity to learn even more about Covid-19, the cost of tests could be guaranteed by the government but with an expectation that those responsible for these settings would pay for testing. These include:

- Other professional sports
- Social-care providers
- University halls of residence
- Large employers
- Restaurants, cafes and bars (staff)
- Festivals

Conclusion

This paper builds on the five previous reports we have written on testing. It makes clear that the central change needed to take the UK's testing strategy to the next level is to move clearly and publicly to a shared objective of mass testing.

This means working with industry, bringing in all those who can contribute, to test as many people as possible, as often as possible.

With this clear objective, the UK should take the following steps:

1. Set out clearly that mass testing is now the country's strategy.
2. As part of the step change in how we approach testing, the government's response must go up a gear too.
3. Ensure government has the right team, with a mixture of expertise from across relevant sectors, to build stronger links between the private sector and government.
4. Move to a new, simplified, five-pillar strategy on delivering mass testing:
 - Pillar One: Lab-based Tests
 - Pillar Two: Non-lab-based tests
 - Pillar Three: The ecosystem of testing suppliers
 - Pillar Four: The "moonshots"
 - Pillar Five: The administering, communication and coordination of mass testing
5. Bring onstream all possible viable tests, supporting in particular the development of rapid, point-of-use antigen tests.
6. Work across sectors to put in place the framework to deliver the mass testing regime, with testing conducted in a range of appropriate settings: e.g. at work, at travel hubs and so on.

Given the high number of asymptomatic cases of the virus, and the growing threat of a second wave this autumn, it is only through this combination of measures that the UK can avert a looming economic catastrophe.

Annex: Support for Mass Testing

There is growing support for mass testing and recognition that it is the most effective measure to contain Covid-19 and enable people to live safely alongside the virus. This support transcends political boundaries and is backed up by objective academic research.

Examples include:

Dr Michael Mina – Epidemiologist at Harvard University

Dr Mina places rapid, on-the-spot tests in the same category as vaccinations when it comes to Covid-19 solutions. In a recent call with reporters, covered by the *Harvard Gazette*,³⁶ Dr Mina called for a shift from focused testing to mass testing and recognised that even rapid tests with low accuracy would be effective. According to Dr Mina, “[Mass testing] will stop the vast majority of transmission and it will cause these outbreaks to disappear in a matter of weeks.”

The article includes examples of tests already on the market but which struggle with navigating regulatory bodies and have limited access to funding. This is a problem on both sides of the Atlantic, as this paper demonstrates. Dr Mina envisions a future where tests are taken “every single day, or every other day” and, akin to this paper’s recommendations, positive rapid-test results are backed up by an RT-PCR test.

Sergio Romagnani – Professor of Clinical Immunology at the University of Florence

A study covering the Italian town of Vo’Euganeo has been well-documented.³⁷ It covered 3,000 people in an isolated village that had been exposed to Covid-19, serving as an ideal sample group. Romagnani wrote that the great majority of people infected with Covid-19 – 50 to 75 per cent – were asymptomatic but represented “a formidable source” of contagion.

The academic concluded that “...the percentage of people infected, even if asymptomatic, in the population is very high and represents the majority of cases, particularly, but not only, among young people. Isolation of asymptomatics is essential for controlling the spread of the virus and the seriousness of the epidemic.” This was followed by recommendations to employ large-scale testing to find and isolate asymptomatic cases, particularly among health workers who might unwittingly pass the virus to colleagues or patients.

The New England Journal of Medicine

The journal published an important article that weighed the inevitable but necessary impact of mass testing on civil liberties against the need to control Covid-19.³⁸ Its authors concluded that mass testing was necessary, given that it could “reduce or prevent the need for much greater intrusions.” The paper

suggested that a “degree” of voluntariness is maintained by eschewing forced testing and instead conditioning social privileges on cooperation. Ultimately, it recommended that “[mass testing] seems like a fair price to pay for safely and fairly resuming a semblance of normal life.”

Paul Romer (Nobel Prize-winning economist and former Chief Economist at the World Bank)

From the onset of Covid-19, Paul Romer has recognised mass testing as the solution to resolving the economic fallout of Covid-19. ³⁹ Identifying that the key to recovery is to rebuild confidence, Romer modelled the use of mass surveillance testing across the US and concluded that “until a vaccine is developed and deployed, the simplest and safest path to this outcome is a national testing strategy that marshals our existing resources to test everyone in the US once every two weeks and isolates all those who test positive.”

Footnotes

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