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COVID-19

Scotland's Testing Strategy – Adapting to The Pandemic

August 2020

Scottish Government
Riaghaltas na h-Alba
gov.scot

COVID-19: SCOTLAND'S TESTING STRATEGY - ADAPTING TO THE PANDEMIC

SECTION ONE – INTRODUCTION – WHY WE TEST

Scotland's overall pandemic strategy is set out in *COVID-19: A Framework for Decision Making*, published on 23rd April 2020. That strategy is to suppress the virus – driving the number of cases to the lowest levels – to enable as close to normal life as possible to resume, while remaining vigilant and ready to respond quickly to prevent new cases transmitting onwards.

We know meeting this challenge requires a comprehensive set of public health measures of intelligence, anticipation, prevention, mitigation and response – no one intervention on its own will suffice. Our testing strategy is one key part of this approach.

Our approach to testing has already adapted as the pandemic has progressed in Scotland, and will continue to adapt as we deal with the distinctive challenges of future phases into winter. Our approach to testing will also adapt as the science and evidence base around the behaviour of the virus builds – in particular on transmission – and as innovations come on stream. This ability to adapt to the conditions facing us is a key principle of our approach.

Figure 1 – Why we test – adapting to the pandemic

FROM	TO
Testing to support direct patient care at the peak of the pandemic.	Testing to support direct patient care as the NHS remobilises
Testing to enable keyworkers to return to work	Testing to reduce transmission to the lowest levels possible including protecting vulnerable groups at higher risk by testing health and care workers
Testing for population surveillance to understand national epidemic progression	Testing for population surveillance to understand national epidemic progression - extended to support early warning and monitor key sectors including schools
Antibody testing for direct clinical care and population surveillance	Continued antibody testing for direct clinical care and population surveillance, plus research to establish any immunity link
Lockdown reducing opportunities for transmission	Proactive case finding, testing asymptomatic people in high risk contexts, subject to expert advice

The table above sets out how our approach to testing has already adapted during the course of the pandemic as prevalence of the virus has changed. During lockdown, opportunities for transmission were considerably reduced in the population and the core strategy then was to use testing to save lives; to ensure that critical staff could return to work if it was safe for them to do so, and to monitor the spread and prevalence of the virus.

The 'why' of our testing approach has changed as the pandemic has progressed and as we navigate our way out of lockdown. Testing for COVID-19 in Scotland is currently undertaken for three main reasons:

- to reduce the risk of transmission and continue to drive the number of cases down to the lowest possible levels;
- to support patient care; and
- to enable surveillance of the disease in the population and in particular sectors.

As we move through the weeks and months ahead we will continue to adapt our strategy to address the pandemic conditions we face, and in doing so we will apply the eight key the principles below to guide and shape our strategy.

TESTING STRATEGY – PRINCIPLES

1. Testing is part of our overall public health approach designed to minimise transmission of the virus, in line with our overall strategy of driving the number of cases of COVID-19 in Scotland to the lowest levels possible and maintaining that level.

2. Our priorities for testing are informed by scientific, clinical and public health advice from our expert advisory structures.

3. Our approach to testing, including prioritisation, is flexible and adaptable to the prevailing conditions of the pandemic at any time, and informed by expert advice.

4. Our approach to testing takes full recognition of the limitations of testing (particularly at low levels of disease prevalence) as well as the opportunities of testing.

5. Our overall priority at this stage of the management of the disease is rapid identification and testing of people with symptoms.

6. Asymptomatic testing will increasingly be used on a risk based approach to both minimise transmission through active case finding and to reduce harm to individuals at high risk.

7. The deliverability of any new testing priorities and pathways will be considered at an early stage to maximise successful implementation.

8. The capacity to accurately and efficiently record, report, interpret and respond to every test in a timely manner is critical.

SECTION TWO - WHAT TESTS WE USE

There are two types of test for COVID-19 currently in use in Scotland: viral (PCR) testing and antibody testing. PCR tests are used to detect if someone is currently infected with the virus; and antibody testing is used to tell us if someone has had the virus.

PCR tests, used to test for current infection, operate as a swab taken from the nose and back of the mouth, with the sample collected sent to one of the existing NHS Scotland laboratories, or the Glasgow Lighthouse Laboratory, to be analysed. Any positive cases identified are automatically followed up for contact tracing through our national system of Test and Protect.

Antibody testing is used to test for past infection. In Scotland currently, it is used to track what proportion of the population has already been exposed to the virus. We don't yet know whether people who have had the infection are immune and cannot get infected again, nor how long any immunity, if proven, may last. Until this evidence base develops, our current policy is to use antibody testing for population surveillance purposes, and in limited clinical scenarios.

In addition to PCR testing, and antibody testing, Scotland has world leading research expertise in viral genomics. Genome sequencing of the COVID-19 virus is currently being undertaken by a Glasgow and Edinburgh partnership working as part of the COVID-19 Genomics UK (COG-UK) Consortium.

Whole Genome Sequencing contributes to our understanding of how the disease moves through the population and changes over time. In particular it can improve our understanding about whether cases are likely to be linked or not. As rapid sequencing is now being delivered in Scotland (with results available within 48 hours of a sample arriving at the appropriate laboratory) it has the potential to play an important role in providing information to support the management of outbreaks. Whole genome sequencing can also show geographic links – and help us understand what region or country that virus emerged from.

Limitations of testing

No test is perfect, and understanding the limitations of the tests we currently use is important. If we assume tests are perfect, and that results always accurate, we put others at risk.

In PCR testing, the key risks are false negative results – where a test is negative but the person tested does actually have COVID-19 and is infectious – and occasions where the test is positive but the person tested is not infectious.

False negative results can happen if a swab misses collecting cells infected with the virus, or if virus levels are low – for example, at the start of an infection. The risk to others of false negative results is clear – an infectious person who receives a negative result risks transmitting the virus to others, including vulnerable people who can suffer very severe harm. In certain situations, testing again after a number of

days – when levels of the virus may be higher and therefore detectable – can reduce the risk of false negative results having serious consequences.

Weak positive results can happen when the swab picks up fragments of the virus from an individual who is no longer infectious. Laboratories in Scotland have now implemented confirmation testing (or repeat testing) in certain circumstances to confirm whether weak positive test results are actually infectious cases.

Opportunities of testing

Understanding the limitations, and applying the principles for the use of testing as advised by our expert scientific advisory groups, in the context of our overarching pandemic strategy, means we can use Scotland's enhanced capacity for testing in optimal and agile ways in the next phases of the pandemic.

If we know the limitations of PCR testing are higher where prevalence is low, and we know our overarching strategy is to drive the number of cases to a low a level as possible, then we know the opportunity is to use our capacity now to actively find cases where they are most likely to be, and where they are likely to do most harm, while simultaneously building our capacity for winter when there will be a growing need to distinguish COVID from other common respiratory illnesses.

We will also actively monitor developments around testing innovation so we can take advantage of any new opportunities from testing they present.

SECTION THREE - PRIORITIES - WHO WE TEST

TESTING PRIORITIES – NEXT PHASE

1. Whole Population Testing of anyone with symptoms (Test & Protect).

2. Proactive Case Finding by testing contacts and testing in outbreaks.

3. Protecting the vulnerable and preventing outbreaks in high risk settings by routine testing.

4. Testing for direct patient care, to diagnose and to treat, and to support safe patient care as NHS services restart.

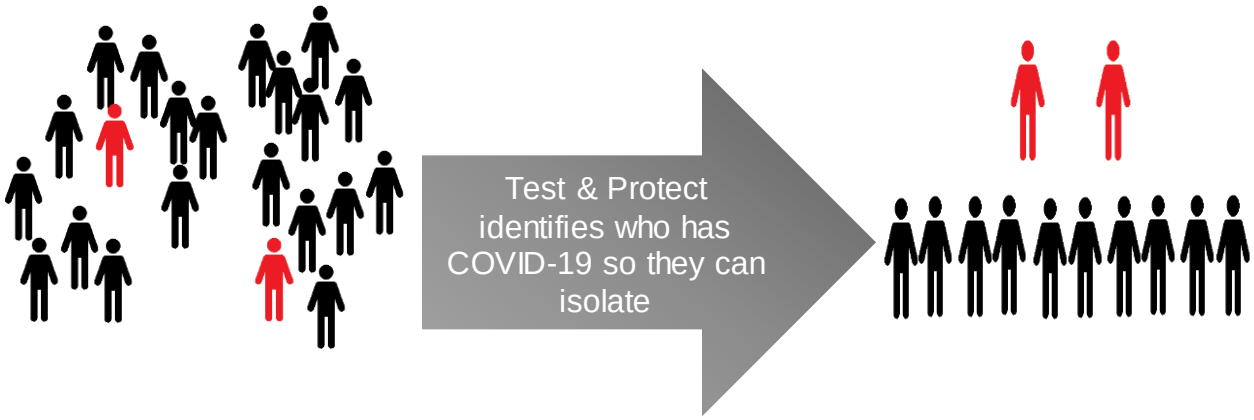
5. Surveillance to understand the disease, track prevalence, understand transmission and monitor key sectors.

Whole Population Testing of Anyone with Symptoms

Our first priority is testing people with symptoms, and the preparation of sufficient capacity to test increasing numbers of people with non-specific symptoms, which may or may not be COVID, in autumn and winter.

Building and enhancing our public awareness campaign on COVID-19 symptoms and how to book a test is one element of this work. Improving access to testing for people – in particular in the community – is the other element. This includes simplification of routes to booking a test, better sign-posting of non-digital routes to testing and better access to testing for those who do not have a car.

Figure 2 – Testing people in the community with symptoms of COVID-19



Proactive Case Finding by Testing Contacts and Testing In Outbreaks

Our second priority is proactive case finding by testing close contacts and testing in outbreaks. Advice from our COVID-19 Expert Advisory Group indicates proactive case finding - hunting for the virus - through selected asymptomatic testing has high levels of potential benefit for the strategic aim of suppressing transmission to the lowest levels possible.

The highest level of benefit in terms of reducing transmission will be from identifying those most likely to have been infected. The highest level of benefit in terms of reducing harm will be from detecting asymptomatic positive cases who may transmit to high risk individuals in high risk settings.

At this point in time in the pandemic, those most likely to have been infected include contacts of index cases who have been traced. Once established as PCR-positive, a contact would become a new index case allowing a new range of contacts to be identified and the prevention, and earlier ending, of transmission chains.

The European Centre for Disease Control suggested in its recent June update that testing strategies could extend to testing asymptomatic contacts if resources allow, in order to find new cases, allow for onward tracing of their contacts sooner, and break transmission chains. Given the successful expansion of capacity to both undertake PCR testing (swabbing capacity) and process the results (laboratory capacity), resource does now allow for this, and Scotland will now move to offering testing all close contacts of index cases.

As the pandemic progresses over the next phase, the expected pattern of transmission is of local outbreaks and clusters of cases. Testing will be a key tool as part of the overall public health management response to outbreaks.

When an outbreak has or is suspected to have occurred, local health protection teams will use testing to identify further cases among those who are linked to the outbreak, as part of the wider incident management arrangements.

The rapid deployment of Mobile Testing Units in response to outbreaks will support swift testing (followed by contact tracing and isolation of contacts) as part of the public health response to minimising the outbreak and its potential to contribute to wider community transmission.

Protecting the Vulnerable and Preventing Outbreaks in High Risk Settings by Routine Testing

The third current priority is protecting the vulnerable and preventing outbreaks in higher risk settings – which we know from experience and from evidence includes healthcare and social care settings.

In addition to these settings having experienced transmission rates that were generally higher than the community, they can also contain large numbers of people who are elderly, frail and in poor health, putting them at increased risk should they become infected. While the primary public health interventions for reducing the risk

of transmission in health and social care settings are appropriate infection prevention and control (IPC) measures including physical distancing and PPE, there may also be a role for testing in these settings as part of a package of response.

In social care settings, our current policy is to minimise the risk of new cases of COVID-19 entering a care home setting by testing all people discharged to care homes from hospital and all those entering care homes from the community, both symptomatic and asymptomatic. In addition, in recognition of the risk of care home staff introducing the virus to a care home, possibly when asymptomatic or presymptomatic, weekly testing of all care home staff was introduced from 25th May.

When a care home finds a suspected case of COVID-19, the local health protection team initiates an investigation which includes testing all residents and staff. Where care homes are part of a group of homes, given the potential for staff to work between different care homes of the same provider, testing is also conducted in link homes.

The final part of our current testing policy in care home settings is to regularly test a sample of care homes where there is no current infection for surveillance purposes and to better identify, as early as possible, any potential new outbreaks.

In hospitals, current policy is that all asymptomatic healthcare staff are tested where there is an outbreak in a previously COVID free ward. From early July, this was extended to include weekly testing of healthcare staff working in specialist oncology wards, long term care of the elderly wards, and long term care wards in mental health facilities.

Testing for Direct Patient Care, To Diagnose and To Treat, and To Support Safe Patient Care as NHS Services Restart

Our fourth current priority is testing for direct patient care. This testing supports diagnosis and therefore guides appropriate patient care for those presenting with potential COVID symptoms. Since the start of the pandemic, ICU patients and all symptomatic patients admitted to hospital have been tested, both to ensure they receive the necessary care and to protect against onward transmission.

As the NHS remobilises as we cautiously move through the Routemap, more patients who do not have symptoms will be tested prior to receiving healthcare, particularly in circumstances where treatment would be deferred if they tested positive, for example, those undergoing elective surgery or treatments which involve immunosuppression.

Surveillance to Understand the Disease, Track Prevalence, Understand Transmission and Monitor Key Sectors

Our fifth priority is significantly expanding surveillance testing - both at a whole population level and in key sectors. This is to monitor prevalence of the disease, better understand transmission and support our journey through the Routemap.

Community surveillance testing includes PCR testing of people who have mild or moderate illness to help us understand levels of active disease, and antibody testing to improve our understanding of how many people have been infected with the virus.

Public Health Scotland (PHS) is leading the Enhanced Surveillance of COVID-19 in Scotland (ESoCiS) programme on behalf of Scottish Government which encompasses this PCR and antibody testing, in addition to other surveillance measures.

In a significant expansion of population level surveillance testing, Scotland will also participate in the ONS COVID-19 Infection Survey, which will represent the single biggest expansion of asymptomatic testing for surveillance purposes to date in the pandemic, building to 15,000 individuals tested every two week rolling period. This equates to approximately 9,000 households.

The survey will involve all participants providing throat and nose swabs to test whether they currently have the virus. A subset of the sample will also provide blood samples, which will be tested for antibodies to COVID-19. Individuals will be asked to take tests every week for the first five weeks and monthly for a period of 12 months in total. Each participant is also asked a short set of questions concerning socio-demographic characteristics, symptoms, whether self-isolating or shielding, and whether the participant has come into contact with a suspected carrier of COVID-19.

Critically, the information from the study will be linked to the Community Health Index (CHI) enabling future linking to other health datasets in Scotland and further analysis. Given much is yet to be understood about the long term health impacts of COVID-19 on those who have recovered from infection, and how these impacts vary by different groups of people, this data linkage will be critical in providing evidence in these poorly understood areas which will directly support the effective long term management of those who may still suffer from post COVID related health harms.

In healthcare, Scotland is participating in the SIREN study which seeks to understand whether the presence of COVID-19 antibodies protects people from future infection and also to provide evidence of prevalence of COVID infection among healthcare workers across Scotland.

In a significant expansion of healthcare worker surveillance testing, the aim is to recruit 10,000 NHS workers in Scotland to the study, covering all health boards. Each healthcare worker will be PCR and antibody tested every 2 weeks over a 12 month period. This will help our understanding of the body's immune response to COVID-19 and track prevalence rates within that population.

In schools, in addition to the testing of individuals with symptoms and increased testing that takes place in the context of an outbreak, we will implement testing of a sample of the school population for the purposes of surveillance. This testing as part of our surveillance approach will play an important role in supporting the safe return and ongoing safe operation of our schools.

Testing for surveillance will involve a sample of the school population being tested for COVID-19 and for SARS-CoV-2 antibodies at intervals to determine if they have evidence of current or past infection.

These surveillance studies will include school worker testing and surveys, and school pupil cohort surveillance, which will provide data that can be used for providing incidence and prevalence estimates to understand any level of infection or exposure in schools. Any positive tests found would be further tested for whole genome sequencing to understand where any transmission may have occurred.

SECTION FOUR – HOW WE TEST

Scotland's infrastructure for testing for COVID-19 has developed considerably since the beginning of the pandemic. This infrastructure includes an expansion of where and how people can have the test conducted ('swabbing'); where, and how rapidly, the tests are processed in laboratories; and, critically, how the results of tests are linked to our data infrastructure and the patient record to support appropriate action at an individual, community and population level.

Both quality and speed are critical elements of each stage of the PCR testing process.

There are six Regional Testing Centres in operation where swabbing takes place (Glasgow, Aberdeen, Edinburgh, Perth, Prestwick and Inverness) and eighteen Mobile Testing Units located in different parts of the country. In addition, home testing kits are available – usually for self-administering, though all Health Boards have arrangements in place to support those who might find completing a home test challenging – for example through home visits from the community nursing team.

The Scottish Ambulance Service will take over responsibility for the operation of mobile testing units in Scotland from the beginning of September 2020.
Mobile units will be deployed to support a comprehensive approach to managing outbreaks. The Scottish Ambulance Service role in overseeing mobile testing units is part of the strategy of creating the long term sustainable capacity in Scotland to manage the pandemic, building on our services where they have extensive existing knowledge and experience of the geography in Scotland and ensuring testing capacity exists in all areas – including remote and rural areas.

Improving access

While much of the attention in testing is focussed on sampling and processing and our capacity to increase these as part of our winter preparation; equally important is that all groups in our communities can easily both book a test and access a test when required.

We know there are potential barriers for some – for example, the regional test centres, and often the mobile units, require access to a car.

We know too that the best way to understand these barriers is to speak to people in our communities, in line with our overall principle from the *Framework for Decision Making* to engage with the people of Scotland as the pandemic progresses. We are engaging with the public as we continue to design our testing services and continuously improve their accessibility and usability by different groups.

Our Test and Protect engagement work is using feedback from people who have been through the test processes in Scotland to make improvements. We have also launched a Dialogue public engagement exercise to better understand barriers to access tests by directly engaging with the public in Scotland.

And our Health Boards play a critical role here. All Health Boards have established patient transport systems, to provide support to those without access to transport.

Sampling and Laboratory developments

Since the beginning of the pandemic, there has been significant development and expansion of both the sampling (swab-taking) and the laboratory infrastructure and capacity in Scotland.

Access to sampling (swab taking) has grown rapidly and there are now a number of established channels available which enable clear pathways for accessing testing to be defined and shared publicly. Sampling channels include Regional Test Centres, Mobile Test Units, NHS hospitals and community centres, Care Homes, home testing, Satellite Hubs, and imminently Walk Through sites. Laboratory capacity to process swabs has also grown rapidly, and is now in the region of 35,000 tests per day.

Further demands on this capacity in the immediate future will come from an anticipated rise in people with COVID-like symptoms over the winter months; testing all close contacts of index cases; testing in the context of outbreaks; and testing to support both direct patient care and mitigate against the risk of hospital based transmission as the NHS remobilises. Our surveillance testing programmes will also require capacity around both PCR test processing and antibody test processing.

We know with winter coming that we will need to continue to build this capacity and its sustainability. We intend, working with the UKG programme, to continue to build sampling pathways, and to build laboratory processing capacity to approximately 65,000 tests per day between NHS Scotland laboratories and the Lighthouse Lab in Glasgow.

The Lighthouse Laboratory in Glasgow is a crucial component to enabling increased testing in Scotland. We have an agreement with the UK Government that the Glasgow Lighthouse Laboratory will operate on a Scotland first approach, up to the level of 40,000 tests per day. Ongoing liaison with the University of Glasgow ensures an integrated approach to the service across Scotland, both in terms of quality and performance of service delivery.

We also plan to build resilience and sustainability in our NHS Scotland laboratory capacity on a regional basis. In a proposal delivered in partnership with our clinical and scientific community, we will invest in new equipment on a regional basis, providing additional capacity for a further 10,000 tests a day. This will ensure that microbiology and virology laboratories have the ability to deliver responsive business as usual testing, and provide resilience and support with the anticipated increased demand as winter pressures drive up the need for COVID-19 testing to differentiate between respiratory infections and COVID-19.

Being ready to adapt

The testing priorities of the next three months to November may be different to the following three months to January 2021, and to the period beyond that. Our priority

in the next phase is using testing as part of our overall strategy of continuing to drive down cases to as low a level as possible, so that schools can reopen, universities and colleges return, and as close to a new normal can be experienced by our communities.

We know in the winter the challenges may increase. We know this virus transmits more easily indoors, and that people will be spending more time indoors in winter. We know there are risks of other illnesses, including seasonal flu, occurring at the same time as potential increase in COVID transmission.

We can see now the likelihood for the demand for testing to grow, testing that will be critical in order to genuinely distinguish COVID from other illnesses. It is not inconceivable for the numbers of people with symptoms compatible with COVID, who will require testing, to be in the tens of thousands per day in winter in Scotland.

This means one of our core principles of our strategy - that our approach to testing, including prioritisation, is flexible and adaptable to the prevailing conditions of the pandemic at any time – will require genuine translation into action. It means there may be groups we test now that we will not test in winter, or that prioritisation for testing in winter is considered to protect those most at risk of most harm.

These decisions may not always be easy. They will require being well informed by those with expertise in every aspect of an effective testing system that makes maximum contribution to minimising harm – from the scientific, clinical, public health communities, virology and microbiology, operational, logistics and delivery expertise, modelling and scenario planning capabilities, and a clear understanding of ethics, acceptability and the impact of any changes to testing eligibility on the whole system.

Innovations

Being ready to adapt also means being ready to take advantage of innovations in testing should they become available. Looking ahead, we expect to see developments in testing capability, which could bring about significant changes in our approach to testing by making sample collection more straightforward, and turnaround times quicker.

For example, if testing of saliva samples is found to be sufficiently accurate to be a suitable alternative to current nose and throat swabs, and if a robust supply chain is in place, this could be used to make sample collection more straightforward. This could mean that even more people could self-sample, rather than requiring a sample to be taken by a trained member of staff, and it would avoid the discomfort that some experience when a swab is taken.

Progress is also being made with the development of rapid point of care or near point of care testing, which would enable rapid results to be provided, with testing potentially undertaken outwith laboratory settings. While it is unlikely that these types of tests would replace the gold standard laboratory PCR tests, they could have a significant role by providing results in less than an hour.

SECTION FIVE – CONCLUSION

Testing is one important tool in our overall approach to managing the pandemic in Scotland and reducing as far as is possible all of the harms caused by COVID-19. Testing does not – in and of itself – reduce transmission of the virus. Testing provides information that can enable us to take action to reduce transmission of the virus. That is why it is always important to see it as one part of the picture – and to have a continual focus on the rationale for testing, the outcomes we seek from any changes to our testing, and our overall strategy.

Testing does not directly limit the opportunities for the virus to find bridges to other people in close contact; it does not reduce the risk of becoming infected by the virus by touching a contaminated surface; and it does not mitigate the risk of being infected from droplets from an infectious person. That is why face coverings; avoiding crowded places; cleaning surfaces; and physical distancing remain the absolute key to lowering opportunities of the virus to spread.

Testing is critical for direct patient care; for understanding disease progression and patterns; and for reducing transmission as part of Test and Protect. Its role in winter is likely to become even more critical. This strategy will be updated as the evidence base continually builds; as innovations provide new, better and faster possibilities; and as we continue to move through the Routemap through and out the crisis.

Testing is a vital tool in any pandemic, which, when used effectively, judiciously, in line with clear principles, advised by experts, and in full understanding and awareness of its strengths and its limitations, will help us to continue to suppress the virus in line with our overall strategy.

This publication is available at **www.gov.scot**

Any enquiries regarding this publication should be sent to us at
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St Andrew's House
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ISBN: 978-1-83960-779-0 (web only)

Published by The Scottish Government, August 2020

Produced for The Scottish Government by APS Group Scotland, 21 Tennant Street, Edinburgh EH6 5NA
PPDAS751366 (08/20)