COVID-19 Testing and Tracing

Roadmap to enhance capacity and turnaround

14th May 2020

Seirbhís Sláinte Níos Fearr á Forbairt | Building a Better Health Service

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*Explanatory note

This document outlines two papers:

1. The review commissioned on the HSE testing and tracing pathway – dated 24 April 2020
2. Progress update on the testing and tracing pathway – dated 14 May 2020

1.Introduction

1.1 Purpose

A rapid review was commissioned by HSE leadership on 15th April 2020 to analyse the end-to-end testing infrastructure for COVID-19 and to outline initiatives to improve its performance. It was concluded on 24th April 2020 for consideration by HSE Leadership, the HSE Board, the Department of Health, Cabinet and NPHET.

The paper presents a view of the target performance levels needed at each stage of the process to effectively deliver a testing pathway that will consistently and sustainably deliver increased capacity levels and reduced turnaround times while mitigating the associated risks.

The stages of the review undertaken include GP referral, community swabbing, laboratory testing and contact tracing process. The paper also outlines a summary of the primary risks and constraints.

The document also outlines progress to date on all actions outlined in the original paper.

1.2 Context

The HSE recognises that the availability of widespread, responsive testing with a short turnaround time is critical to the public health response to the COVID-19 pandemic. It has a key public health role in:

- Enabling disease surveillance;
- The identification and understanding of spread of the disease;
- Understanding characteristics of the disease;
- Enabling and enhanced understanding of incidence and management of outbreaks;
- Understanding of incidence in different geographical locations and age groups;
- Triggering key public health actions to break chain of transmission of virus.

The importance of having a robust, sustainable and flexible testing, detection and contract tracing infrastructure cannot be overstated. This is vital to support changes in the case definition and the easing of restrictions on movement for society. The capacity the HSE is working to deliver includes testing in the community, in acute settings, additional groups identified as priority or high-risk and an expectation of future changes in public health testing policy, for example to refer all close contacts of confirmed positive patients for testing.

2. Current State

2.1 End to End Testing Process at as 24th April 2020

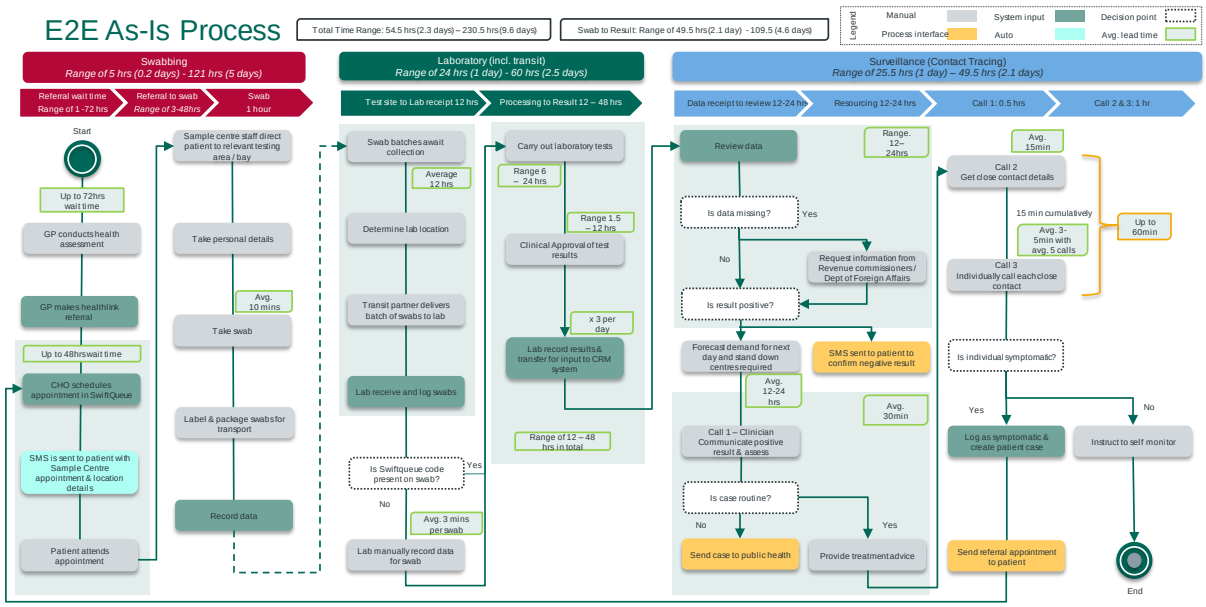
The HSE developed the existing testing infrastructure, taking unprecedented measures to build a robust end-to-end process with multiple pathways at great pace. This has faced challenges, most notably laboratory capacity and the supply of reagents. Challenges were also experienced with the communication of negative results. The testing backlog has been cleared and we have investigated and dealt with any residual issues.

While these challenges have been overcome, scaling the capacity and increasing the turnaround time will bring new ones. We should not underestimate the challenge to achieve consistent high levels of swabbing, laboratory testing and contact tracing seven days per week.

In this paper, when we refer to 'turnaround time', we refer to the time from an individual requesting a test (typically through their GP in a Community Setting) to the communication of results. Many international examples of turnaround time refer only to the time from Swab to Result. For reference, we also highlight our expected timelines for this part of the process for the purposes of international comparison.

The diagram below shows the testing pathway for tests performed in the community through at one of our 48 existing swabbing centres.

End-to-end testing process as at 24th April 2020



3. Roadmap of Initiatives to be Implemented

We undertook a rapid and detailed review of the end-to-end process. The outcome of this assessment presents steps that will be taken to optimise the existing infrastructure to enable it to be scaled to deal effectively with the expected increase in demand. It is also aimed at reducing the turnaround time while ensuring that the process continues to operate with the appropriate clinical oversight from public health. These proposed changes are planned to be implemented on a phased basis over the next four weeks.
The key changes outlined will be in place by Monday 27th April, Tuesday 5th May and Monday 18th May. The changes, including capacity, timelines and activities required are presented below in Tables 1, 2 and 3. The turnaround time presents the percentage of test that will be processed according to defined timeframes.

3.1 From 27th April

Date		**Monday, 27th April**
End-to-end Capacity		10,000 tests a day
Swab to Result		3 days on average
End-to-end Turnaround Time	15%	1 – 2 days
	70%	≤ 5 days
	15%	> 5 days (exceptions)

Table 1: Enhancements planned before April 27th

We will increase capacity to 10,000 tests per day through the end-to-end COVID-19 testing and contact tracing process by 27th April. To achieve this throughput and achieve the timeframe targets as set out in Table 1, it is critical the that the following initiatives have been implemented:

1.1 *Increased Swabbing at Community Testing Sites:* Key changes are required to the operation of Community Testing Sites including to increase capacity; increased opening hours and staff, additional lanes in drive through facilities and reopening of old sites not currently required due to low demand. These changes will allow for c.5,500 swabs taken per day from Community Testing Centres. NAS will continue to support swabbing by delivering c.3,000 swabs per day and hospitals will continue to deliver c.1,500 per day.

1.2 *Changes to logistics of delivery of swabs to laboratories*: Smooth operation of logistics channels to the large laboratory sites is required and all swab data needs to be fed directly from SwiftQueue to the laboratory information system.

1.3 *Automation of results data between NVRL and Case Tracker CRM:* The automation of results between NVRL and CRM will allow for much greater efficiencies and will enhance the turnaround time of results by up to 24 hours. This automation has commenced, and we foresee that it will have been tested and is fully operational on Monday 27th April. To date, the data files with patient results (both positive and negative) have been issued from NVRL to the Contact Training team as secure files up to five times daily. This means that the data has had to be quality checked, cleansed and uploaded manually. In the event that required data is missing (some 20% of cases are currently missing a contact phone number), this data is sent firstly

to the Revenue Commissioner and then if required to Foreign Affairs to identify the missing phone numbers. This is a manual process that in its entirety can take up to 24 hours to complete.

1.4 *Updated Call Scripts and Training:* To enable tracers refer all close contacts for testing, the current call scripts (for Call 3s) need to be updated. This training and updated guidance will be prepared but will not be rolled-out to callers until direction comes from NPHET on its implementation.

3.2 From May 5th

Date		**Tuesday, 5 May**
Capacity		12,000 tests a day
Swab to Result		2 – 3 days on average
End-to-end Turnaround Time	15%	1 – 2 days
	70%	≤ 5 days
	15%	> 5 days

Table 2: Enhancements planned before May 5th

We will increase capacity to 12,000 tests per day through the end-to-end COVID-19 testing and contact tracing process by May 5th. To achieve this throughput and the turnaround targets as set out in Table 2, it is critical the that the previously outlined and following initiatives are in place:

2.1 *Additional Community Testing Centres*: To support the increased testing requirement and likely high demand in Dublin, an additional Community Testing Centre is required. A proposed site has been identified in Dun Laoghaire Port to support this region. Discussions have commenced to ensure this site can be operational by May 5th. This change along with changes implemented for April 27th will enable the Community Testing Centers to deliver 7,500 tests. NAS will continue to deliver 3,000 swabs and hospitals 1,500 swabs.

2.2 *Increase of deliveries to laboratories***:** The commencement of twice daily deliveries of swab batches from testing centers to community laboratory sites, in conjunction with a reliable advance forecast of testing volumes at testing sites is required.

3.3 From May 18th

Date		**Monday, 18 May**
Capacity		15,000 tests a day
Swab to Result		1 – 2 days on average
End-to-end Turnaround Time	20%	1 – 2 days
	70%	≤ 1 – 3 days
	10%	> 4.5 days

Table 3: Enhancements planned before May 18th

We will increase capacity to 15,000 tests per day through the end-to-end COVID-19 testing and contact tracing process by May 18th. To achieve this throughput and the timeframe targets as set out in Table 3, it is critical the that the previously outlined and following initiatives are in place:

3.1 *Automate scheduling of swab appointments*: To further increase the capacity of swabs taken, the scheduling of appointments will be automated. This will decrease the time from referral (via the various paths) to appointment. Appointments will be allocated nationally rather than within each CHO, whilst ensuring CHOs are kept informed of numbers.

3.2 *HSE Out of Hours Referrals:* Throughput at weekends is considerably lower than during weekdays, meaning that patients who develop symptoms over the weekend often wait until the next working day to visit their GP. Options needs to be assessed to provide an appropriate out of hours route including:

- *Option 1: HSE Referral Line:* A phone referral system to reduce the referral wait time for patients by increasing access to a referral out of hours. This system will enable patients to speak to a clinician who will follow a series of questions to determine if a test is required. Where a test is required the clinician will create an appointment in SwiftQueue. This system will alleviate pressure on GPs which will be especially important as they resume increased levels of business as usual work.
- *Option 2: Self-Referral:* An online self-referral by patients. This option will enable someone to interact with the existing "HSE BOT" and if symptomatic, to be redirected to an online referral form to capture their details and schedule a swabbing appointment. This will also alleviate the pressure on GPs and the HSE Referral Line proposed above, ensuring referrals are entering the system quickly and efficiently. Steps 3.3 and 3.4 will reduce the time it takes to get a swab, which is not currently measured but has implications in terms of containing the spread of the virus.
- *Option 3: GP Out of Hours*: Leveraging the existing GP out of hours service to provide referrals for Covid-19 testing.

3.3 *Additional laboratory capacity and operating shift patterns:* the ramp-up of laboratory capacity and expanded working hours at community laboratory sites will be required. This will allow us to achieve an uplift in throughput of laboratory testing.

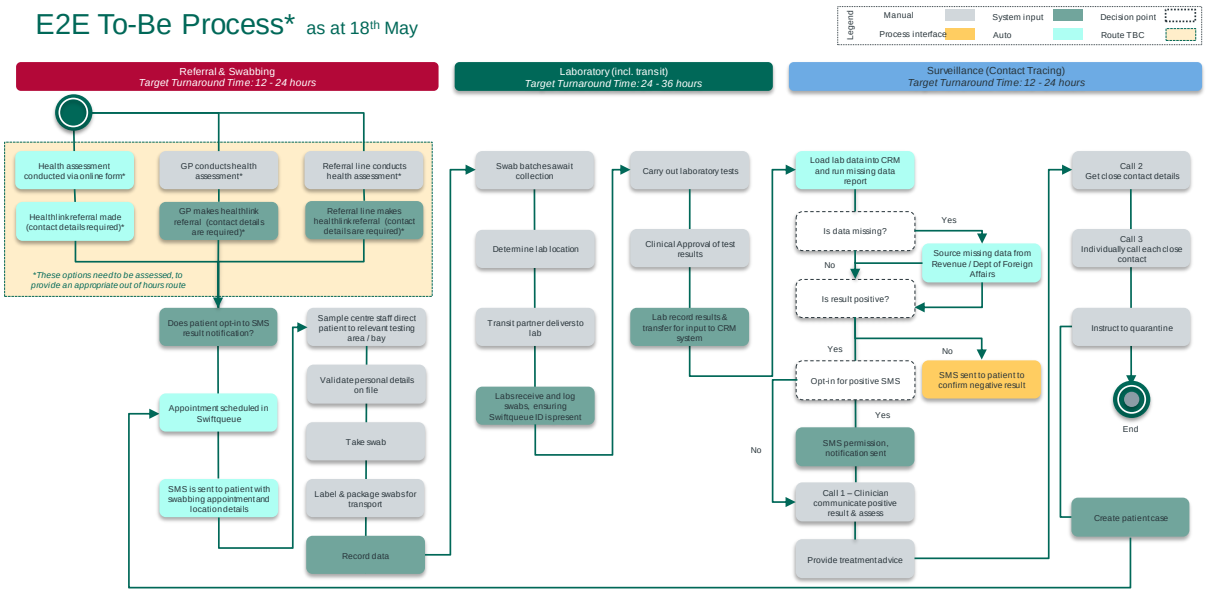
3.4 *Opt-in and text to receive positive results by SMS*: To ensure that patients are receiving information as quickly as possible, we will notify patients of a positive result by SMS. At the point of appointment confirmation, we will ask patients via SMS to opt-in to receiving a positive result via SMS. For those that opt-in, Call 1 will be replaced by a text message with a contact number provided for patients who wish to Contact Centre Staff. This will enable a multi-channel approach in the communication of test results which will improve turnaround times in notifying patients of results and will enable Call 1 clinicians to support the increased contact tracing capacity.

3.5 *Introducing Active Management:* Active management of contacts of a confirmed case will be introduced. It involves pro-actively following up with the contacts on a

daily basis to track any onset and development of symptoms. Daily calls will be required until day 5 when the contact will be referred for testing. As this would drive a fivefold increase in the calls to close contacts, introducing active management requires significant automation changes to reduce call volumes to manageable levels. This will be achieved through the use of automated SMS text messages to close contacts with automated response capture.

3.6 *Design of Service and Automation:* In order to sufficiently manage the increased need to contact trace and introduce active management of contacts of a confirmed case, significant automation of processes and data collection needs to be introduced to achieve timely results and information are being provided to citizens through the channel of choice.

The diagram below shows the target (to-be) testing pathway for tests performed in the community.



4. Technology

Significant and rapid progress has been made by our HSE ICT team, with clinical input, to build and enable systems to support the end-to-end process. Moving to a more effective testing infrastructure requires additional changes to support operations, and to deliver timely data across the various process steps. Changes required include automation of manual data transfers, further automation of manual activities, where possible, and the inclusion of new needs such as active management of contacts of a confirmed case.

As part of the national response to Covid-19, work is underway to develop a national app for contact tracing and real-time symptom tracking. The primary purpose of the app is to enable the health services to improve the speed and effectiveness of contact tracing and to map and predict the spread of Covid-19 in support of the overall goal to flatten the curve and prevent the spread of Covid-19 to others in our community.

The app will augment the existing contract tracing process in Ireland by reducing the time it takes to notify an app user that they have been in close contact with someone who has coronavirus and provide them with the right information and advice. It will also enable notification of close contacts that may be unknown to the app user.

The completion of development of the app is on track for the end of May and will be followed by a large-scale field test. The DPIA and technical documents will be made available in parallel with the field test and this will be followed by full launch of the app, subject to the necessary approvals from NPHET, HSE and Government.

5. International Studies

The volume of tests undertaken globally is steadily increasing as individual countries scale up their testing infrastructure. While Ireland's volume increased to 860 tests by 19th of April, we are behind some of our international colleagues as illustrated in Table 4.

Table 4: Examples of International Testing per 100,000 population

Country	COVID-19 Testing (per 100,000 people) as of 19 April
Hong Kong	1,758
Australia	1,651
Singapore	1,620
USA	1,125
Ireland	860
United Kingdom	739

Source: FindDx.org (as of 19 April 2020), Health policy Watch

Internationally the world has seen gradual progress toward faster turnaround times of testing. Currently most countries deliver COVID-19 tests within 1 - 4 days (examples in Table 5 below), from swabbing to patient receiving results. Referral and contact tracing times are not included in that timeframe.

Table 5: Examples of International Testing Timeframes

Country	Turnaround Time	Contact tracing strategy
Australia	1 – 4 days	App
United Kingdom	2 – 3 days	Contact tracing team
United States	2 – 7 days	Contact tracing team
South Korea	within 24 hrs.	App
Germany	1 – 2 days	App
France	2 – 3 days	App
China	More than 24 hrs.	Mobile, digital and surveillance technology
Singapore	c24 hrs.	App

Source: Figures based on official Government guidance on result waiting times (from point of test to receiving results – excluding contact tracing)

Several countries have developed rapid testing turnaround times using various approaches. Some of the rapid turnaround times related to patients within an acute facility where testing takes place in close proximity to the laboratory sites. Table 6 overleaf presents some examples which do not include the time required for contact tracing.

Table 6 Examples of Rapid Testing Turnaround - sourced from grey literature or pre-publication pieces and represent an informal view of international strategies.

Country	Time	Description
South Korea	c24 hrs.	Large scale drive through testing sites (more than 50).
Singapore	10 min.	Rapid serology tests. These must be conducted in conjunction with clinical examination and confirmed with supplemental testing.
Hong Kong	8 hrs.	Passengers arriving on flights are swabbed and must stay at the airport testing centre and wait for results.
UAE	24 hrs.	Patient held in isolation facility at the hospital after swab test until the result is released.

Timings listed are from the time of the swab taken to the results being given to the patient.

6. Risks and Constraints

The risks and proposed mitigations are presented below across the full end-to-end of the process. We will continue to work to mitigate these risks as we deliver increased capacity and longer-term sustainable testing service.

Area	Risk	Mitigation
General	1. A spike in demand will challenge the end-to-end process given the ramp-up in volumes from the current level of activity. Likewise, a large increase in demand in a particular geographical area will put pressure on community swabbing centres in that area.	1. Planning is underway to mitigate this risk, however the ability of the system to deal with a large increase in demand is untested at present.
	2. Change in case definition, the automatic referral of all close contacts for testing and shifting services back to BAU pose a significant risk to our ability to accurately forecast demand and assign appropriate resource at each stage of the process. The availability of staff to cope with additional demand will have a limit, and ultimately have an impact on timeliness of communicating results.	2. Further detail and advance sight of planned policy changes and their expected impact on operations would support detailed scenario planning nationally and within specific geographic areas.
	3. Ongoing challenges in the global supply chain for swabbing kits, reagent, equipment and PPE, will continue to be a risk.	3. Supply chain monitoring is ongoing, and efforts to diversify suppliers and sources continues. Pressure will remain given the global demand for these products
	4. Increased bulk testing at long-term residential care facilities (LTRCFs) beyond Nursing Homes will draw from the available testing capacity therefore reducing capacity for general community testing.	4. Greater clarity on the demand for this activity will facilitate planning and building resilience in the system.

Swabbing	1. Availability of staff to do swabbing may reduce if demand in acute and community rises sharply 2. Availability of NAS may change over time due to a return to more normal activity for them 3. Use of sporting and educational facilities may not be available Long-term. 4. Long-term resourcing for when other parts of the health service resume normal operation. 5. Timeframe for changes requiring ICT changes to Covid Care Tracker, HealthLink and SwiftQueue is tight.	1. Consider how to recruit and train a sustainable cohort of staff to swab who are not needed in acute or community settings (e.g. at Nursing Homes) 2. Development of a medium-term approach for large scale, on-site testing. 3. Development of a medium-term approach alternative sites and staff. 4. Consideration to upskilling some personnel to take on testing roles, and shifting work, where possible, to administrative staff. 5. Clear prioritisation of changes required and close cooperation across all stakeholders to ensure changes are managed.
Laboratory Testing	1. The rapid scale up of the large test facilities. 2. The use of large-scale laboratory facilities means that longer batch processing times are required to facilitate efficient use of equipment (reagent) and high throughput. 3. Requirement for social distancing and shift pattern restrictions to manage infection control risk at all laboratory sites. 4. Risk of an outbreak or reduced capacity at large laboratory site.	1. Close monitoring of the scale up in tests processed at laboratory sites will be done with laboratory partners. 2. This will be a feature of using large laboratory sites in order to achieve the throughput required. 3. This will remain a constraint as it is an inherent risk in the laboratory process. 4. Sourcing of additional laboratory test partners is being pursued to ensure additional capacity and resilience in the event of a loss of capacity.

Contact Tracing	1. Staff deployed to contact tracing may go back to their primary functions. 2. Training and deployment of new staff impacts of performance levels in CTCs. 3. Rapid scale up in volumes of activity. 4. A change in case definition, referrals of all close contacts of positive cases and the addition of active management of contacts of a confirmed case can completely overwhelm current capacity.	1. Government decision to keep those deployed in contact tracing activity for the full duration of the pandemic (vast majority are public servants for this reason). 2. Blending new and experienced staff, constant communication and engagement with mobilisers in each contact tracing centres. 3. Stress testing current operations to provide resilience 4. Sourcing an App that can manage part of the process through automation. If calls are required there is potential to look at outsourcing to a commercial contact centre.

7. Summary of Progress on Testing and Tracing - 14th May 2020

This section contains an update on the actions committed to within the original paper in order to enhance the end-to-end Covid-19 testing infrastructure. It presents a summary of initiatives in train and progress made to date.

Between the time of submission of the report and its publication significant progress has been made to optimise the testing and contact tracing process. A number of outcomes have been achieved in relation to the end to end testing system performance and the current position is outlined below.

Referrals and Swabbing

In the vast majority of community referrals, patients are now receiving same day appointments or next day (85%). The average is 0.6 days from referral to swab appointment. Capacity exists to take 12,000 swabs per day across community, hospitals and NAS.

Laboratory testing

Our current Laboratory capacity is currently at c.15,000 tests per day. The typical turnaround time from swab taken to result from laboratory is averaging 3.3 days for Community Testing and 0.8 day for Hospital Testing. Based on the volumes associated with both at this time the overall average turnaround time is 2 days.

Contact Tracing

In the Contact Tracing Centres, which have been set up for routine cases, routine cases are closed out within 1 day. Complex/specialised cases are handled by Public Health Departments. All contact tracing for both complex and routine cases will aim to be closed out within 24 hours

Active Management of Contacts of Confirmed Cases

A close contact of a confirmed case will now get an SMS for up to 14 days after they were last in contact. The SMS will ask about their health status, and if they become symptomatic, advises them to ring their GP or a newly designated contact tracing centre to arrange a test.

Current End-to-End Turn Around Times (Last seven days)

- The average turnaround time from swabbing to laboratory result is 2 days.
- The average turnaround time from referral to laboratory result is just under 3 days.
- **The average turnaround time for from swabbing to the completion of contact tracing is 4 days.**
    - In hospitals, the average turnaround time for swab taken to completion of contract tracing is 3 days.
    - In the community, the average turnaround time for swab taken to contact tracing completed for all cases is typically 4.5 days.

- In the community (in hospitals there is no referral stage), the average end to end turnaround time for referral to contact tracing completed is 5 days.

Progress against initiatives outlined

Initiatives due for completion by 27th April 2020:

Initiative Number	Initiative Description	Applicable testing process stage	Progress made to date
1.1	Increased Swabbing at Community Testing Sites to handle 5.5k a day nationally	Community Testing	Completed – 25th April 2020
1.2	Changes to logistics of delivery of swabs to laboratories	Laboratory	Completed – 27th April 2020
1.3	Automation of results data between NVRL and Case Tracker CRM	ICT	Completed – 22nd April 2020
1.4	Updated Call Scripts and Training	Contact Tracing	Deferred by NPHET until Nursing Home testing was complete On track for 18th May

Initiatives due for completion by 5th May 2020:

Initiative Number	Initiative Description	Applicable testing process stage	Progress made to date
2.1	Additional Community Testing Centres	Community Testing	Completed – 5th May 2020 Capacity was reached by re-opening other sites
2.2	Increase of deliveries to laboratories	Laboratory	Completed – 5th May 2020

Initiatives due for completion by 18th May 2020:

Initiative Number	Initiative Description	Applicable testing process stage	Progress made to date
3.1	Automate scheduling of swab appointments	Community Testing	On track for completion 18th May 2020
3.2	Out of hours referrals*	Referrals / Community Testing	This initiative has evolved and is detailed in 4.3 in the table below
3.3	Additional laboratory capacity and operating shift patterns	Laboratory	On track for completion 18th May 2020
3.4	Opt-Out and text to receive access to positive results by SMS	ICT / Contact Tracing	Expected for completion by 20th May 2020

3.5	Active Management of Contacts Introduced	Contact Tracing	Implemented via SMS on 9th May, further automated version due to be ready by 20th May 2020
3.6	Design of Service and Automation	Contact Tracing	Ongoing initiative

Additional Initiatives Underway

As part of embarking on some of these initiatives, further learnings were discovered, helping us to identify new initiatives and shift our thinking and further evolving existing plans.

4.1 *Supplies management process:* We have optimised the management of reagent from our suppliers and to our labs. This ensures that we don't experience delays in testing and can operate to full capacity.

4.2 *GP Query helpline:* Timely communication of results is very important, and we recognise the frustration of those who are waiting for results more than a few days. We believe turnaround times have improved significantly but there remain examples of delays which is unsatisfactory. To help alleviate this issue, we are putting in place a concierge service for GPs, to enable them to send test queries to a dedicated team that will respond with an update within an agreed timeframe. We will ensure that these queries will be prioritised and that results are communicated with urgency.

4.3 *Out of hours referrals:* To reduce the referral wait time for patients who develop symptoms out of hours, an initiative was proposed to set up a phone referral system. Upon a more detailed review of this initiative and due to the complexity involved in standing up this service with the appropriate clinical governance, the thinking has shifted towards enabling referrals through the GP out of hours service. The technical, commercial, communications and clinical components are current being captured and consultation with GPs will commence this week to agree the design of this service. The target date to have implemented this change is 30th May.

4.4 *Testing Dashboard:* To ensure that we have full visibility of the end to end process, we have initiated the creation of a dashboard that will be updated daily. This dashboard allows us to monitor capacity levels, throughput and turnaround times within each stage of the process. It will enable us to act fast if any issues arise, and make better data driven decisions when introducing new processes and optimising/removing existing ones. We are continuously iterating and improving the dashboard as we address data entry and integration challenges.

4.5 *Improvements to appointment attendance:* At present when a patient attends for a test the process to mark their attendance is manual and is in some cases being performed at the end of the day. To improve real time visibility of demand for the labs and to ensure real-time data on swabs performed is available there is a requirements to improve the automation of marking a patients attendance for testing to reduce the manual effort and increase accuracy.

4.6 *Barcoding and automated data capture:* Test swabs today are sent to the laboratory with a manually produced manifest, checking off the receipt to the laboratory requires manual effort. This improvement will look to provide a method of automatically recording and producing the manifest of samples sent to the lab through bar coding and automated data capture to ease tractability of test for queries and problem solving.

Progress against additional initiatives outlined

Initiative Number	Initiative Description	Applicable testing process stage	Progress made to date
4.1	Supplies management process	Laboratory	Complete
4.2	GP query helpline	Contact Tracing	14th May 2020
4.3	Out of hours referrals	Referral / Community Testing	30th May 2020
4.4	Testing Dashboard	All stages	Live 11th May 2020
4.5	Improvements to appointment attendance	Community Testing	5th June 2020
4.6	Barcoding and automated data capture	Community Testing	5th June 2020