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COVID-19: Testing for Sars-CoV-2 in the UK; and the Use of Testing and Contact Tracing in Selected Countries

This briefing paper has been prepared to assist the Health Committee and COVID-19 Committee with their scrutiny of the COVID-19 testing strategies in the UK to date by reviewing testing in the UK and in a selection of other countries. The paper highlights the importance of both timely testing and contact tracing (manual tracing and ICT developments) to drive suppression of transmission of the virus to a low-level, to enable or maintain parts of economic and social life.

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1. COVID-19 Pandemic: Testing for SARS-CoV-2 - Context

Countries across the world are at different stages of dealing with the COVID-19 pandemic. By 13th March 2020, the World Health Organisation (WHO) called for intensified action and stressed that countries should take a comprehensive approach[1]:

> *Not testing alone, not contact tracing alone. Not quarantine alone. Not social distancing alone. Do it all. Find, isolate, test and treat every case…*

By then, across the world, governments had implemented measures to decrease contact between people to slow transmission of the virus, for example, closed schools, sealed borders, cancelled cultural and sporting events and imposed social distancing measures. Some countries, but not the UK, had also implemented extensive testing for SARS-CoV-2 (the virus that causes the illness COVID-19) and quarantining regimes.

The WHO has consistently called for extensive testing of all suspected cases so that confirmed cases are promptly isolated and receive care, and their close contacts are rapidly identified so that they can also self-isolate/be quarantined and monitored.[2] It recently highlighted that in countries where there has been early implementation of such an approach, for example South Korea, the spread of COVID-19 has been suppressed below the threshold at which health systems become unable to prevent excess mortality.[3]

However, in places where community transmission has led to outbreaks with near exponential growth (for example in Italy, Spain, UK), such countries were forced to introduce widespread physical distancing measures and movement restrictions ('lockdown') in order to slow the spread. These measures have brought social and economic life to a near stop. For such countries, there is now an urgent need to plan for a phased transition away from such restrictions to enable the suppression of transmission of the virus to a low-level, whilst enabling the resumption of parts of economic and social life.[4]

This paper focuses specifically on reviewing the approaches to testing, contact tracing taken and related measures in NI, other jurisdictions of the UK and a number of selected countries.

[1] 'Do not let this fire burn': WHO warns Europe over Covid-19, The Guardian, 13th March 2020, https://www.theguardian.com/world/2020/mar/13/european-countries-take-radical-steps-to-combat-coronavirus

[2] COVID-19 Strategy Update, 14th April 2020, WHO, page 8, https://www.who.int/docs/default-source/coronaviruse/covid-strategy-update-14april2020.pdf?sfvrsn=29da3ba0_19

[3] COVID-19 Strategy Update, 14th April 2020, WHO, page 3, https://www.who.int/docs/default-source/coronaviruse/covid-strategy-update-14april2020.pdf?sfvrsn=29da3ba0_19

[4] COVID-19 Strategy Update, 14th April 2020, WHO, page 3, https://www.who.int/docs/default-source/coronaviruse/covid-strategy-update-14april2020.pdf?sfvrsn=29da3ba0_19

2. Testing for SARS-CoV-2 and for Antibodies to the Virus

2.1 Reasons to Test

There are a number of reasons for testing people with the **diagnostic test** for the presence of the SARS-CoV-2 virus:

- To diagnose them individually as patients who are presenting with symptoms;
- As front-line healthcare or other essential workers with symptoms (to self-isolate if positive or return to work if negative),
- 'Surveillance testing' - to gain an understanding of how far the virus has spread in the wider community - cases may be mildly symptomatic or asymptomatic and not come to the attention of a healthcare professional;
- As part of a strategy to find and test **all** suspected cases so that confirmed cases are promptly isolated and their close contacts rapidly identified.

The aim is also to be in the position to conduct widespread testing of the blood of individuals for antibodies to the virus to see if they have had the virus in the past.

2.2 Types of Tests

2.2.1 Diagnostic Test for Sars-CoV-2

The diagnostic test uses molecular diagnosis with a method called 'real-time RT-PCR (RdRp gene) assay' using swab samples. The science is complex and involves laboratory technicians looking for genetic sequences specific to the virus in the sample. The virus's genome is made of RNA so this means first turning the RNA into DNA.[5]

When a clinician suspects COVID-19, they take swab samples for testing from the nose, throat and deeper respiratory tract. In the UK, Public Health England (PHE) started firstly using its own network of eight laboratories[6], but later expanded to a further 40 NHS labs to conduct the tests needed. Further laboratories from universities, research institutes and private companies have become or are becoming involved.

In NI, the Health Minister, Robin Swann, recently stated that NI is seeking to increase its testing capacity (working with laboratories outside of the traditional health and care

[5] Le Page, M. (2020), Coronavirus: How do I get tested and how does the test work?, New Scientist, Daily Newsletter, 6th March 2020, https://www.newscientist.com/article/2236610-coronavirus-how-do-i-get-tested-and-how-does-the-test-work/

[6] Guidance and Standard Operating Procedure – COVID 19 virus testing in NHS laboratories, NHS England and NHS Improvement, https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/guidance-and-sop-covid-19-virus-testing-in-nhs-laboratories-v1.pdf

sector), to validate new tests locally in association with the national centre in Oxford and to investigate the scope for manufacturing the necessary reagents in NI.[7]

2.2.2 The Antibody Test

The antibody test works by looking for signs of immunity, by using a drop of the person's blood.

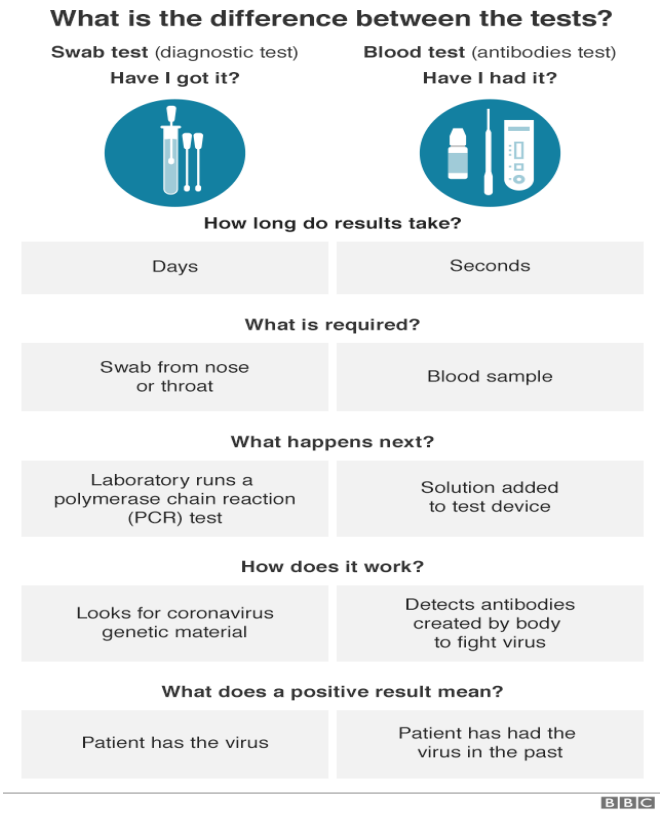
A reliable laboratory-based antibody test is in use at the PHE government laboratory at Porton Down (England), but it is currently being reserved to estimate population-level immunity and not to give individuals information about their antibody status.[8]

Recent progress in this area has been rapid in sourcing an antibody test for more widespread use in the UK. Media reports on 4th May 2020 stated that a first coronavirus antibody test could soon be approved by PHE as government scientists are currently evaluating the accuracy of a test made by Roche, which was cleared for use by the US Food and Drug Administration on 2nd May.[9] In a separate development, on 4th May 2020, a new "fast and accurate" coronavirus antibody test was reported by a company called Quotien with scientists based in Scotland and Switzerland. Quotien stated that each serological screening machine has capacity for up to 3,000 tests a day and produces results in 35 minutes with 99.8% accuracy. The company is now keen to hold talks with UK ministers amid interest from Europe for the machines.[10]

2.2.3 The Tests – Infographic

The following infographic from the BBC shows the difference between the diagnostic and antibodies test.[11]

[7] Opening Statement to Ad Hoc Committee, 15th April 2020, Health Minister, NI, https://www.health-ni.gov.uk/publications/doh-ministerial-announcements-and-statements-2020
[8] Schraer, R. (2020), Coronavirus: How close is the UK to 100,000 tests a day?, BBC News, Health, Reality Check, https://www.bbc.co.uk/news/health-51943612
[9] Bodkin, H. (2020) Coronavirus antibody tests could be approved by Public Health England this week, The Telgraph, 4th May 2020, https://www.telegraph.co.uk/news/2020/05/03/coronavirus-antibody-tests-could-approved-public-health-england/
[10] Coronavirus: New 'fast and accurate' antibody test developed, BBC News, 4th May 2020, https://www.bbc.co.uk/news/uk-scotland-52529294?intlink_from_url=&link_location=live-reporting-story
[11] Schraer, R. (2020), Coronavirus: How close is the UK to 100,000 tests a day?, BBC News, Health, Reality Check, https://www.bbc.co.uk/news/health-51943612



3. WHO Recommendations for a Testing Programme

The WHO COVID-19 Strategy Update (14th April 2020) outlines the importance of a robust testing programme and what this should comprise:[12]

> *Stopping the spread of COVID-19 requires finding and testing all suspected cases so that confirmed cases are promptly and effectively isolated and receive appropriate care, and the close contacts of all confirmed cases are rapidly identified so that they can be quarantined and medically monitored for the 14-day incubation period of the virus.*

To achieve this it states that countries must increase their capacity to identify suspected cases of COVID-19 in the general population quickly, based on the onset of symptoms, by:[13]

- Shifting from relying on existing surveillance networks to a system of rapid, population-level active surveillance in communities, health facilities, and at points of entry:
    - This needs a rapidly scaled up workforce of contact tracers;

[12] COVID-19 Strategy Update, 14th April 2020, WHO, page 8, https://www.who.int/docs/default-source/coronaviruse/covid-strategy-update-14april2020.pdf?sfvrsn=29da3ba0_19

[13] COVID-19 Strategy Update, 14th April 2020, WHO, page 8, https://www.who.int/docs/default-source/coronaviruse/covid-strategy-update-14april2020.pdf?sfvrsn=29da3ba0_19

- Enabling the general population to practice self-surveillance by self-reporting as a suspected case as soon as they have symptoms and/or if they are in contact with a confirmed case:
    - countries will need new technology e.g. online applications (apps);
- Testing immediately suspected cases to confirm or rule out COVID-19. In contexts where testing is not possible, confirmation may instead be based on reported symptoms;
- Effectively and rapidly isolating confirmed cases:
    - ideally, this would mean isolation in dedicated supportive facilities; or
    - if cases are required to self-isolate in households, there should be appropriate follow-up and support;
- Identifying and tracing close contacts of every confirmed or probable case, and quarantining and monitoring them for 14 days. This ensures that even pre-symptomatic cases and asymptomatic cases that arise as a result of contact with a confirmed case do not mix with the general population; and
- Supporting individuals in isolation/quarantine, including through the provision of necessities, income support, psychosocial support, and health care.

4. Progress in Testing for COVID-19 in the UK

4.1 Overview

The numbers and groups of people being tested across the UK has continually changed over the past few months as the COVID-19 pandemic has progressed.

There has been criticism in the media and from professional bodies about how long it has taken the UK to increase the number and range of people tested. The aim was to reach 100,000 tests per day being done across the UK by the end of April, with just over 43,000 taking place as of 27th April and 73,400 by 29th April 2020.[14] On the last day of April, the Health Secretary, Matt Hancock stated that more than 122,000 coronavirus tests had been 'provided' on that date. However, it seemed that some 'creative accounting' was involved to meet the target as the figure included 40,000 tests sent out, including directly to people's homes, which may not yet have been actually used or sent back to a laboratory.[15]

[14] Coronavirus: Testing opens for millions more people in England, BBC News, 29th April 2020, https://www.bbc.co.uk/news/uk-52466814
[15] Coronavirus: Target reached as UK tests pass 100,000 a day, BBC News, 1st May 2020, https://www.bbc.co.uk/news/uk-52508836?intlink_from_url=&link_location=live-reporting-story

For NI, by the 2nd May 2020, 25,385 individuals had been tested (3767 tests were positive).[16]

Across the UK, developments in testing have continued since the start of the pandemic and particularly through the month of April due to increases in capacity.

The NI Department of Health (DoH) and Public Health Agency (PHA) have largely been part of the UK-wide response on testing, following the advice of the Westminster Government. On 15th April 2020, the NI Health Minister, in a statement to the NI Assembly Ad Hoc COVID-19 Committee, referred to the COVID-19 Testing Strategy for NI that had been shared with the NI Executive and the NI Health Committee.[17]

The NI Testing Strategy has short term (1-4 weeks), medium term (4-8 weeks) and longer-term (8-16 weeks) actions. It aligns with the UK's strategic approach to scale-up testing and with work being progressed in the other Devolved Administrations. It also takes account of testing plans in the Republic of Ireland.[18]

4.2 Containment Phase

In the earliest phase of the COVID-19 response (the 'containment phase'), the priority in the UK was to test the small numbers of cases (people who became unwell after travel to an affected area) and trace their contacts.

4.3 Delay Phase

On 12th March 2020, the UK moved to the 'delay phase' recognising the fact that community transmission was occurring[19] and the guidance for testing became to test only those patients requiring admission to hospital (for at least one night) that had:[20]

- Either clinical or radiological evidence of pneumonia; or
- Acute respiratory distress syndrome; or
- Influenza like illness (fever ≥37.8°C and at least one of a range of acute onset respiratory symptoms.

[16] COVID-19 Testing Overview, Department of Health, https://app.powerbi.com/view?r=eyJrIjoiZGYxNjYzNmUtOTlmZS00ODAxLWE1YTEtMjA0NjZhMzlmN2JmIiwidCI6IjljOWEzMGRlLWQ4ZDctNGFhNC05NjAwLTRiZTc2MjVmZjZjNSIsImMiOjh9

[17] Opening Statement to Ad Hoc Committee, 15th April 2020, Health Minister, NI, https://www.health-ni.gov.uk/publications/doh-ministerial-announcements-and-statements-2020

[18] RaISe given permission by the Health Committee to see the COVID-19 Strategy for NI, 6th April 2020.

[19] COVID-19: government announces moving out of contain phase and into delay, UK Government Press Release, 12th March 2020

[20] COVID-19 Investigation and initial clinical management of possible cases, Section 2, Case Definitions PHE, 18/03/2020, https://www.gov.uk/government/publications/wuhan-novel-coronavirus-initial-investigation-of-possible-cases/investigation-and-initial-clinical-management-of-possible-cases-of-wuhan-novel-coronavirus-wn-cov-infection#interim-definition-possible-cases

4.4. Healthcare Staff and their Households

Further into the 'delay phase', by the end of March 2020, tests started to be rolled out to NHS healthcare staff with symptoms and their households.[21] This move followed criticism from healthcare staff and from the British Medical Association about lack of testing for this group. A growing number were in self-isolation with symptoms (not able to work) and a number had sadly died.

In NI, as part of the UK-wide NHS initiative on staff testing, testing (by appointment) for healthcare staff started on 4th April 2020, at a drive-through facility in the car park at the SSE Arena in Belfast. The PHA was involved, with input from HSC Trusts and the drive-in facility complemented work undertaken by Trusts to scale up their own testing.

Other initiatives include the establishment of a consortium between Queen's University, Ulster University, C-TRIC[22], and AFBI[23] to scale up diagnostic testing. The consortium is pursuing local production of reagents required for tests and will undertake validation of antibody tests when they become available. The NI Health Minister highlighted that not being able to scale up testing numbers more quickly was not down to:[24]

> *….a lack of will or action. There are significant challenges including laboratory and staffing capacity and the unprecedented levels of global demand for testing reagents and swabs*.

4.5 Essential/Key Workers and Their Households

The 23rd April 2020 in England saw the extending of testing to all 'essential workers' with symptoms and their households. The definition of 'essential worker' was extended to include teachers, hospital cleaners, public servants, emergency services, supermarket staff, delivery drivers, and other critical infrastructure staff.[25]

'Essential workers' use an online portal to enter their details and then receive a text or email inviting them to either book an appointment at one of more than 30 drive-through testing sites, or receive a home testing kit. Test results from the drive-thrus are sent out

[21] Coronavirus: Health workers on frontline to be tested in England, BBC News, 27th March 2020, https://www.bbc.co.uk/news/health-52070199

[22] Clinical Translational Research and Innovation Centre (C-TRIC) on the Altnagelvin Hospital site in Derry/Londonderry.

[23] Agri-Food and Biosciences Institute

[24] McDaid, B (2020), First COVID-19 testing operation for healthcare workers in NI opens in Belfast, Derry Journal, 5th April 2020, https://www.derryjournal.com/news/people/first-covid-19-testing-operation-healthcare-workers-ni-opens-belfast-2529703

[25] Coronavirus testing extended to all essential workers in England who have symptoms, Department of Health and Social Care (England), Press Release, 23rd April 2020, https://www.gov.uk/government/news/coronavirus-testing-extended-to-all-essential-workers-in-england-who-have-symptoms

by text within 48 hours, and within 72 hours of collection of the home delivery tests. More testing methods are being rolled-out to support accessibility[26]:

- A network of new mobile testing units will travel the country to reach care homes, police stations, prisons and other sites; and
- The delivery service for home testing kits will include Royal Mail and Amazon.

This programme is rolling out across the UK. In NI, testing is now available for all 'key workers' who are self-isolating due to symptoms or because a member of their household has symptoms. In NI, different procedures remain in place for NI HSC staff, who are advised of local testing arrangements by their line management.[27]

For accuracy of the test, people are encouraged to be tested within the first three days of symptoms and not beyond the fifth day of symptoms. Key workers in NI now include:

- Roles necessary for critical national infrastructure, for example postal services, utility, transport sectors, child care for key workers;
- Roles necessary to directly support the health and wellbeing of the community, for example funeral directors, refuse collectors, medical, energy, utility, transport and food supplies, food production, agriculture and food sectors;
- Any government department; and
- The Health and Safety Executive.

Testing is currently conducted in drive-thru only (10am – 4pm, seven days a week) operating at SSE test centre, Odyssey Car park, Belfast; Derry Rugby test centre, Judges Rd, Londonderry; and Craigavon MOT centre, Craigavon. A limited number of home test kits are available for those who are unable to attend by car. Eligible employers can register and refer staff or eligible key workers will be able to book a test directly for themselves or their household.

After entering their details online, individuals receive a text or email inviting them to either book an appointment, or offering a home testing kit.[28] The target for sending results is by text within 48 hours. If everyone with symptoms who was tested in the household receive a negative result, the key worker can return to work (if their work cannot be done from home), providing they are well enough, and have not had a fever for 48 hours.

[26] Coronavirus testing extended to all essential workers in England who have symptoms, Department of Health and Social Care (England), Press Release, 23rd April 2020, https://www.gov.uk/government/news/coronavirus-testing-extended-to-all-essential-workers-in-england-who-have-symptoms

[27] Coronavirus testing for Key Workers in NI, Public Health Agency, HSC NI, https://www.publichealth.hscni.net/covid-19-coronavirus/coronavirus-national-testing-programme-key-workers

[28] The home test option is covered in the booking process. After a suitable self-referral is completed and the individual orders a home-test kit, the test would then be delivered the next day. The swab is self-administered the swab, packed as instructed. A Royal Mail courier will arrive the day after to collect it and take it to the laboratory. Test kits come with further instructions and a short video to take you through the process step by step.

4.6 New Groups for Testing (England)

It was announced in England on 28th April 2020 that more groups in society could now access tests[29]:

- All care home residents and staff, regardless of whether they have symptoms; and
- People over 65 and those who must leave home to work, as well as those they live with, if they have symptoms.

Scotland, Wales and NI were expected to follow but differences have emerged, as Wales said it would not follow England in testing care home residents and staff who are not displaying symptoms.[30]

In NI, on 28th April 2020, the Health Minister highlighted further extension of testing to include all[31]:

- Residents and staff in any care home identified as having a potential outbreak or cluster of infection;
- Patients/residents being transferred into a care home from any setting, whether that be from hospital, supported living or directly from their own home;
- Patients who are admitted to hospital for emergency or elective care; and
- Patients being discharged from acute hospital care to a care home.

4.7 Surveillance Testing

The Royal College of General Practitioners (RCGP) Research and Surveillance Centre (RSC) have been working with PHE to monitor the number of suspected COVID-19 cases in the community incorporated into its usual virology surveillance scheme (4500 GP surgeries involved in England).[32] In addition, the PHE GP in-hours system (and separate 'Out-of-Hours' system) monitors the daily number of GP consultations where patients presented with a range of respiratory symptoms, including COVID-19 cases.

Together these schemes are providing intelligence in England about the number of people who are showing the signs and symptoms of coronavirus.[33] Also the RCGP 'Swabbing Scheme' sees around 200 GP practices taking swabs from patients, or

[29] Coronavirus: Millions more to be eligible for testing, BBC News, 28th April 2020, https://www.bbc.co.uk/news/uk-52462928
[30] Coronavirus: Testing opens for millions more people in England, BBC News, 29th April 2020, https://www.bbc.co.uk/news/uk-52466814
[31] Minister gives breakdown of testing expansion initiatives, Department of Health NI, News Release, 28th April 2020, https://www.health-ni.gov.uk/news/minister-gives-breakdown-testing-expansion-initiatives
[32] RCGP, 13th March 2020, https://www.rcgp.org.uk/clinical-and-research/about/clinical-news/2020/march/covid-19-next-steps-in-primary-care-surveillance.aspx
[33] Account is being taken of the fact that official Government advice has urged people who believe they have coronavirus to contact NHS 111 or visit nhs.net, rather than going to their GP.

asking patients to swab themselves, when they consult a GP for respiratory symptoms.[34]

On 28th April 2020, the NI Health Minister outlined widening surveillance in NI:

- Surveillance based on GPs already involved in the 'Influenza GP Spotter Surveillance System'. This involves testing a sample of patients with respiratory symptoms that do not require referral to hospital or to a Covid centre; and
- Surveillance in Emergency Departments. This will include testing a sample of patients who attend an ED with mild to moderate respiratory symptoms, and who following assessment do not require admission to hospital.

On 16th April 2020, the CMO in Scotland announced an enhanced community surveillance programme for COVID-19 involving two groups:[35]

- 100 patients per day (Monday to Friday) who have mild influenza-like illness or acute respiratory illness and are within 5 days of onset of symptoms and are provided with telephone advice in NHS board Hubs and remain in self-isolation at home; and
- 100 patients per day (Monday to Friday) across Scotland who have moderate influenza-like illness or acute respiratory illness and are within 5 days of onset of symptoms and attend consultations at NHS board Assessment Centres, are provided with advice and return to self-isolation at home.

5. Moving Forward - Testing and Contact Tracing

5.1 What is Contact Tracing and Contact Management

For countries such as the UK, that have had an enforced 'lockdown' for a period of time, finding cases and contact tracing, are now a priority to consider being able to lift 'lockdown' measures. The European Centre for Disease Prevention and Control (ECDC) states this can be achieved through:[36]

- The prompt identification of contacts of probable or confirmed cases;

[34] Coronavirus (COVID-19): Using data to track the virus, PHE, Public Health Matters Blog, 23rd April 2020, https://publichealthmatters.blog.gov.uk/2020/04/23/coronavirus-covid-19-using-data-to-track-the-virus/

[35] Enhanced Surveillance of COVID-19 in Scotland – Community Programme, Office of the CMO, 16th April 2020, https://hpspubsrepo.blob.core.windows.net/hps-website/nss/3016/documents/1_covid-19-cmo-community-surveillance-letter-16-04-2020.pdf

[36] Contact tracing: Public health management of persons, including healthcare workers, having had contact with COVID-19 cases in the European Union – first update, The European Centre for Disease Prevention and Control, 31st March 2020, https://www.ecdc.europa.eu/sites/default/files/documents/Public-health-management-persons-contact-novel-coronavirus-cases-2020-03-31.pdf

- Providing contacts with information on self-quarantine, proper hand hygiene and respiratory etiquette measures, and advice around what to do if they develop symptoms; and
- Timely laboratory testing (all those with symptoms and, if resources allow, asymptomatic high-risk exposure contacts as defined below).

It has published guidance on what is meant by a 'contact' and subsequent contact identification and management.[37] A 'contact' is any person who had contact with a COVID-19 case within a timeframe ranging from 48 hours before the onset of symptoms (or in the case of no symptoms 48 hours before the sample which led to confirmation) to 14 days after the onset of symptoms (or the confirmation). The associated risk of infection depends on the level of exposure.[38]

Immediately after a confirmed or probable case is identified, the next steps as regards contact tracing should include:

- Interviewing the case to collect information on clinical history and possible contacts through a phone call where possible. If cases are already hospitalised, hospital staff may be able to assist in this regard;
- Tracing contacts and classifying them into high-risk ('close contact') or low risk. Information should be collected on whether the contact works with vulnerable populations;
- Arranging for testing of symptomatic contacts (and asymptomatic close contacts where resources allow) for SARS-CoV-2;
- Tracing, and communicating with, the identified contacts and providing information about suitable infection control measures, symptom monitoring and other precautionary measures such as the need for quarantine;
- Contact follow-up - high-risk exposure contacts should be actively monitored by public health authorities (quarantine should be considered), whereas low-risk exposure contacts may self-monitor for symptoms while observing physical distancing measures and avoiding travel. If symptoms of illness occur, contacts should immediately self-isolate and seek medical advice.

[37] Contact tracing: Public health management of persons, including healthcare workers, having had contact with COVID-19 cases in the European Union – first update, The European Centre for Disease Prevention and Control, 31st March 2020, https://www.ecdc.europa.eu/sites/default/files/documents/Public-health-management-persons-contact-novel-coronavirus-cases-2020-03-31.pdf

[38] Contact tracing: Public health management of persons, including healthcare workers, having had contact with COVID-19 cases in the European Union – first update, The European Centre for Disease Prevention and Control, 31st March 2020, https://www.ecdc.europa.eu/sites/default/files/documents/Public-health-management-persons-contact-novel-coronavirus-cases-2020-03-31.pdf

5.2 UK Plans for Contact Tracing and Testing

On 22nd April 2020, the Westminster Health Minister, Matt Hancock, stated that the government would bring in large-scale contact tracing once the number of new cases of the coronavirus falls.[39] This will involve both technology and contact-tracers. Section 6 of this paper looks in more detail at how other countries have successfully used contact tracing.

5.2.1 Technology – Contact-Tracing App

In the coming weeks, the NHS will be launching a contact-tracing app to automate the process of contact tracing. The goal of the app is to alert people who may have been exposed to the virus so they can take action to protect themselves, their families, friends and the health service. The app has the potential to contribute towards a return to 'normality' - but only if a large proportion of the population installs it and follow the advice it provides.

The Royal Air Force base, RAF Leeming, in North Yorkshire trialled of an early version of the software. It set up a scenario designed to simulate people's experience of going shopping, using Bluetooth LE (low energy) signals to log when two phones were near to each other.[40] The app is now to be trialled on the Isle of Wight before being rolled out more widely this month. About 50 to 60% of the UK population would need to download the app for it to be effective.[41]

The following information (unless otherwise referenced) is summarised from the website of NHSX[42], which is responsible for driving digital transformation in the NHS.

The technology for the app is based on evidence developed by epidemiologists, mathematical modellers and ethicists at Oxford University's Nuffield Departments of Medicine and Population Health.

Once installed, the app will start logging the distance between that phone and other phones nearby that have the app installed. If an individual becomes unwell with symptoms of COVID-19, they can choose to allow the app to inform the NHS, which subject to sophisticated risk analysis, will trigger an anonymous alert to those other app users with whom they came into significant contact over the previous few days. The app will advise those who receive these alerts what action to take, depending on the evolving context of the pandemic.

[39] UK will start large-scale contact-tracing as cases fall: minister, Reuters, 22nd April 2020, https://www.reuters.com/article/us-health-coronavirus-britain-tracing/uk-will-start-large-scale-contact-tracing-as-cases-fall-minister-idUSKCN2241W3
[40] Kelion, L. (2020), Coronavirus: NHS contact-tracing app is tested at RAF base, BBC News, https://www.bbc.co.uk/news/technology-52381103
[41] Coronavirus: Contact tracing app to be trialled on Isle of Wight, BBC News, 3rd May, 2020, https://www.bbc.co.uk/news/health-52521526
[42] Gould, M. and Lewis, Dr G. (2020) Digital contact tracing: protecting the NHS and saving lives, NHSX, 24th April 2020, https://www.nhsx.nhs.uk/blogs/digital-contact-tracing-protecting-nhs-and-saving-lives/

The NHSX app, unlike the approach in many countries in Europe, will use a 'centralised' model, with the process of linking those diagnosed with those they could have infected happening on a computer server. NHSX state that this centralised approach allows certain things that cannot be done if it worked just by phone-to-phone propagation. For example[43]:

- Easier to spot people falsely claiming to have virus symptoms;
- Once someone had received a negative test result, to tell people advised to self-isolate because they had been in proximity with them to go out again; and
- Give epidemiologists visibility into how effective the app is proving to be and the means to calibrate it further;

This 'centralised' model contrasts with Apple and Google's proposed 'decentralised' approach - where the matches take place on users' handsets[44] and also puts the UK at odds with Switzerland, Estonia and Austria's Red Cross, as well as a pan-European group called DP3T, which are pursuing 'decentralised' designs. Germany had been in line with NHSX, but its government recently announced that it had switched tack to a "strongly decentralised approach". France advocates a centralised model. For its part, the European Commission has indicated that either model is acceptable.[45]

Apple believes its solution is much more power-efficient. The NHSX's solution involves 'waking up' the app in the background every time the phone detects another device running the same software. By contrast, Apple's solution allows the matching to be done without the app having to 'wake up'.

NHS have established an ethics advisory board for the app, chaired by Professor Sir Jonathan Montgomery from University College London. In future releases of the app, people will be able to choose to provide extra information about themselves to help us identify hotspots and trends. Security and privacy have been built in at all stages of the app's development.

On 28th April 2020, Mr Gould (Chief Executive Officer of NHSX) told the Westminster Science and Technology Committee that the app would be "technically ready" for deployment in "two to three weeks".

A number of issues were raised by the Committee, including whether such an app could effectively become compulsory if its use was made a condition of employment, or for admission to places such as football stadiums. It was suggested that people might not take the app with them, for example, to the supermarket if they felt it would put

[43] Cellan-Jones, R. (2020), Coronavirus: UK contact-tracing app 'ready in two to three weeks', BBC News, https://www.bbc.co.uk/news/technology-52458759

[44] Kelion, L. (2020), NHS rejects Apple-Google coronavirus app plan, BBC News, 27th April 2020, https://www.bbc.co.uk/news/technology-52441428

[45] Kelion, L. (2020), NHS rejects Apple-Google coronavirus app plan, BBC News, 27th April 2020, https://www.bbc.co.uk/news/technology-52441428

them at risk of being told to stay home for two weeks because of a brief contact with someone infected.[46]

In addition, some campaign groups have expressed concerns that signing up to the app could become a compulsory condition for returning to work and being allowed out of lockdown when conditions are eased and that such a condition would amount to coercion.[47]

5.2.3 Contact Tracers

To complement the contact tracing app, the UK government has set a target of recruiting 18,000 contact tracers by the middle of May 2020. Contact tracing in the UK ended in early March 2020 as the strategy moved from 'containment' to 'delay' but the health secretary, Matt Hanock, has said recently that "large scale" tracing will now be a key strategy going forward as the country relaxes its lockdown measures.[48]

Contact tracers are trained to interview people who have been diagnosed with COVID-19 to figure out whom they may have recently been in contact with. If the app works in the way it is hoped, then this will help by automating much of this work. Healthcare workers will then reach out to every one of those contacts, tell them that they may have been exposed, and giving them instructions on what to do next. That may include telling them about possible symptoms or directing them to self-isolate.[49]

There are some concerns that the government may be putting too much faith in technology. For example, the Director of Newcastle University Centre for Excellence in Regulatory Science, recently stated[50]:

> *We don't need fancy expensive apps where people are going to be exposed to issues of data privacy…We should be following... a low-tech model, using people and telephone [interviews].*

In NI, from Monday 27 April 2020, the PHA began a pilot programme of contact tracing to help inform the planned roll out of NI-wide contact tracing:[51]

> *….The contact tracing in the pilot programme will focus on priority groups within the population where clusters of infection may be presenting. Within the current pilot we will be exploring this with a number of care homes….*

[46] Cellan-Jones, R. (2020), Coronavirus: UK contact-tracing app 'ready in two to three weeks', BBC News, https://www.bbc.co.uk/news/technology-52458759

[47] Weaver, M. (2020), Don't coerce public over contact-tracing app, say campaigners, The Guardian, 26th April 2020, https://www.theguardian.com/law/2020/apr/26/dont-coerce-public-over-coronavirus-contract-tracing-app-say-campaigners

[48] Vaughan, A. (2020), UK sets new target to recruit 18,000 contact tracers by mid-May, New Scientist, Health, 28th April 2020, https://www.newscientist.com/article/2242088-uk-sets-new-target-to-recruit-18000-contact-tracers-by-mid-may/

[49] De La Garza, A. (2020), What Is Contact Tracing? Here's How It Could Be Used to Help Fight Coronavirus, Time.com, https://time.com/5825140/what-is-contact-tracing-coronavirus/

[50] Kelion, L. (2020), Coronavirus: NHS contact-tracing app is tested at RAF base, BBC News, https://www.bbc.co.uk/news/technology-52381103

[51] Contact tracing to help limit second wave of coronavirus, PHA NI, 24th April 2020, https://www.publichealth.hscni.net/news/contact-tracing-help-limit-second-wave-coronavirus

5.3 Medium to Longer Term Actions on Testing in NI

The Department's COVID-19 Testing Strategy has been shared with the NI Executive and the NI Health Committee.[52] The shorter-term actions in this strategy have already been outlined above. The strategy also refers to medium to longer term actions[53]:

- **Population surveillance** will also include (medium term) - laboratory blood tests to monitor acquired COVID-19 immunity (antibody tests), support COVID-19 diagnostics and down-stream therapies (e.g. convalescent serum). (Medium term). Work is already established in partnership with Northern Ireland Blood Transfusion Service (NIBTS), Immunology Services and QUB. NI is linking with UK wide workstreams, where appropriate;
- **Point of Care Testing** (medium term) - (diagnostic (nucleic acid) and antibody tests) - important to inform the triage and management of patients attending emergency departments, and to help manage future outbreaks (e.g. prisons, care homes). Provision of point of care tests is being explored in partnership with the national centre in Oxford University;
- **Genomics** - NI is integrating viral and human genome data from NI with UK/Ireland and European programmes (long term); and
- **Linked Data** - Linking health data sets (e.g. genomics) will improve understanding of immunity, co-morbidities, outbreaks and potential control strategies involving organisations like the Honest Broker Service, Biobank etc. (long term).

6. Testing and Contact Tracing in Other Countries

The following section explores the approaches taken by selected countries with regard to testing and tracing. Countries include the Republic of Ireland, as NI's nearest neighbour, also New Zealand and South Korea who have managed to control community transmission of the virus through rigorous testing and tracing. South Korea (and other Asian countries) had a head start on developing contact tracing plans through their response to Middle East Respiratory Syndrome (MERS) in 2015. Its contact tracers are combining patient interviews with cellphone GPS data, credit card transaction records and surveillance camera footage.[54]

Sweden, considered an outlier with regard to its 'light touch' to managing the virus is considered alongside Germany whose rigorous testing and tracing approach is being highlighted as a key reason for its low mortality rate.

[52] Opening Statement to Ad Hoc Committee, 15th April 2020, Health Minister, NI, https://www.health-ni.gov.uk/publications/doh-ministerial-announcements-and-statements-2020

[53] DoH NI Testing Strategy shared with RaISe by Health Committee for purposes of this paper.

[54] De La Garza, A. (2020), What Is Contact Tracing? Here's How It Could Be Used to Help Fight Coronavirus, Time.com, https://time.com/5825140/what-is-contact-tracing-coronavirus/

France, Spain and Italy who have all received significant domestic criticism for their testing regimens in the early stages of the pandemic are examined in the context of their renewed focus on testing as a key part of their exit strategies.

The unique cultural, economic and geographic factors are examined in some countries that potentially contribute to the success or otherwise of their testing regimes.

6.1 Republic of Ireland

In the Republic of Ireland (RoI) widespread community diagnostic testing and contact tracing was originally key to its government's plans. However, the demand for testing dramatically increased from Friday 13th March 2020: [55]

> *….when the threshold for eligibility was lowered. Anyone with symptoms was advised to contact their GP, who, after a telephone consultation, refers their patient on for testing. The removal of consultation fees… inevitably increased the demand for testing.*

This led to around 20,000 referrals per day from the GP network, which in turn resulted in significant backlogs and left many waiting two weeks or more for their results.[56]

By the middle of April 2020, the RoI's testing rate was around 8,600 per million of the population.[57] On 1st May 2020, senior health officials were meeting to consider changes to the Covid-19 testing system that would see the most significant numbers being put forward for testing since the system was overwhelmed in March.[58]

Since late March 2020, those with symptoms of the disease and belonging to one of several priority groups have been prioritised for testing, including healthcare workers.[59] The Health Service Executive (HSE) website outlines the current testing criteria and process and was last updated on 28th April 2020 as follows:[60]

A person should phone their GP to be assessed over the phone for a coronavirus test if they are in one of these situations:

- Suddenly experience **one** of these symptoms and there is no other obvious cause - fever; cough or shortness of breath;

[55] Horgan-Jones, J. (2020), Coronavirus test backlog: How did it emerge and can it be controlled? The Irish Times, 24th March 2020, https://www.irishtimes.com/news/health/coronavirus-test-backlog-how-did-it-emerge-and-can-it-be-controlled-1.4210269

[56] Horgan-Jones, J (2020) Jump in coronavirus tests expected as criteria set to be relaxed, The Irish Times, 1st May 2020, https://www.irishtimes.com/news/ireland/irish-news/jump-in-coronavirus-tests-expected-as-criteria-set-to-be-relaxed-1.4242644

[57] McManus, J. (2020), We are dropping the ball on Covid-19 testing, 16th April 2020, https://www.irishtimes.com/opinion/we-are-dropping-the-ball-on-covid-19-testing-1.4229865

[58] Horgan-Jones, J (2020) Jump in coronavirus tests expected as criteria set to be relaxed, The Irish Times, 1st May 2020, https://www.irishtimes.com/news/ireland/irish-news/jump-in-coronavirus-tests-expected-as-criteria-set-to-be-relaxed-1.4242644

[59] Horgan-Jones, J (2020) Jump in coronavirus tests expected as criteria set to be relaxed, The Irish Times, 1st May 2020, https://www.irishtimes.com/news/ireland/irish-news/jump-in-coronavirus-tests-expected-as-criteria-set-to-be-relaxed-1.4242644

[60] COVID-19, Testing, Health Service Executive, 28th April 2020,https://www2.hse.ie/conditions/coronavirus/testing.html#Priority-groups

- **Have been in close contact** with someone you think or know has coronavirus in the last 14 days and suddenly experience **one** of these symptoms – fever, cough, shortness of breath, blocked nose or sinus, stuffed or runny nose, sore throat, wheezing.

The GP assessment and test are free. After assessment, if the GP decides that the person does not need to be tested, they will still be asked to stay home and self-isolate for 14 days and the people in the household will need to restrict their movements.

Certain groups will be prioritised for tests. These are people with specific symptoms of coronavirus who are also:

- Close contacts of a confirmed case;
- Healthcare workers who are in the frontline and have regular patient contact;
- In groups most at risk of severe infection and the extremely medically vulnerable as outlined in the guidance on cocooning;
- People who live with frontline healthcare workers or with people in the at-risk groups listed above;
- Staff and residents of nursing homes and other residential care settings and those in direct provision, homeless, Roma and travelling community settings; and
- Pregnant women to ensure they are managed safely in hospital.

The GP will arrange any tests and the person will need to self-isolate in the meantime and others in the household will need to restrict their movements. Test details are sent out by text – time, location and a reference number. Because of the high demand for testing there are delays between arranging the test and the appointment. The tests are being done mainly at 46 community test centres (some are drive-thru). If the person cannot attend a centre, they may be tested at home by a healthcare worker.

The HSE acknowledges that results are taking much longer than expected due to high demand. If the result is positive a member of the public health team will phone with the result and ask for the contact details of any close contacts in the last 14 days, in order to do contact tracing to let those people know that they will also need to self-isolate.

As the current pandemic unfolds in the RoI and 'lockdown' restrictions are eased in the future, it has been recognised, as in the UK and in other countries, that there are two key needs[61]:

- To determine as quickly as possible where and when new cases are emerging through diagnostic testing and contact tracing; and

[61] O'Sullivan, K. (2020), Antibody testing key to assessing spread of Covid-19 in population, 13th April 2020, https://www.irishtimes.com/news/health/antibody-testing-key-to-assessing-spread-of-covid-19-in-population-1.4227388

- To pinpoint individuals who have already been infected through an antibody test, but that option is not yet widely available.

Both cohorts are critical to understanding the virus's behaviour – especially its spread over time.

As with the DoH NI, the HSE also plans to release a contact-tracing app. The app, being put together by 'Machine.ie', will alert people when they have recently come in contact with someone who has tested positive for the virus. The plan is to roll it out within the next month. The app is being specifically developed for use in work settings where social distancing is difficult, such as hospitals, where staff could encounter many people every day.[62]

6.2 South Korea (SK)

6.2.1 Overview

The backbone of SK's response has been mass testing, followed by rigorous contact tracing, the quarantine of anyone the carrier has come into contact with and early travel restrictions. The SK government recently stated[63]:

> *South Korea successfully flattened the curve on Covid-19 in 20 days without enforcing extreme draconian measures that restrict freedom and movement of people.*

The measures implemented in SK are common to a number of Asian countries and such measures have also contained the virus in Taiwan, Singapore and Hong Kong.

Japan is an outlier among Asian countries with a low testing rate and no lockdown either. In Tokyo, the centre of Japan's epidemic, just 10,981 people have been tested since February with over 4,000 testing positive. This shows that Japan is only testing people who are already very sick. The official guidelines for say doctors should only recommend a test if the patient has pneumonia. The head of the Japan Medical Association has stated that more prompt testing is needed and although official statistics show new infections decreasing, the number of tests is insufficient to tell that.[64]

[62] Condon, A. (2020), HSE plan to release contact-tracing app within weeks, 26th April 2020, https://extra.ie/2020/04/26/news/irish-news/hse-contact-tracing-app-five-weeks

[63] UNDP Seoul Policy Centre for Knowledge Exchange through SDG Partnerships Website. Flattening the Curve on COVID-19. Available at: http://www.undp.org/content/seoul_policy_center/en/home/presscenter/articles/2019/flattening-the-curve-on-covid-19.html. Accessed: 30.04.20

[64] Wingfield-Haves, R. (2020), Coronavirus: Japan's low testing rate raises questions, 30st April 2020, https://www.bbc.co.uk/news/world-asia-52466834

Asia's democracies such as SK may provide better models for epidemic management in Western countries, rather than looking to China with its very different political system. However:[65]

> *One vital component of the Asian response cannot be replicated. The region's approach has been shaped by the traumatic memories of other recent epidemics — most notably Sars — which meant that governments were better prepared to react fast and forcefully and populations much more willing to co-operate.*

6.2.2 Preparedness and mass testing key to SK's success

SK failed to contain the 2015 outbreak of Middle East respiratory syndrome (MERS), recording 186 cases and 38 deaths. After which the country overhauled its response to respiratory infections, fast-tracking the production of test kits and equipping hospitals with infection control units and negative pressure rooms.[66]

After SK reported its first case of COVID-19 on 20th January 2020, numbers of infections initially remained low before climbing sharply, reaching a peak of 909 daily infections on 29th February 2020.[67] This prompted the government to take decisive action with the 'Korean Centers for Disease Control and Prevention' (KCDCP) leading the strategy on testing and contact tracing.

Post-MERS, the KCDCP had worked to ensure a supply of testing kits in the event of a pandemic and created a system of fast-track approval for testing kits. As a result, a local company called Kogene Biotec developed the Powercheck PCR Kit, two weeks after China released the genetic sequence for COVID-19 and it was available in 50 clinics **three days later**.[68]

The KCDCP also quickly established 635 screening centres which were designed to test as many as people as quickly as possible, while minimising patient-health worker and patient-patient contact. In addition, approximately 50 drive-through testing facilities were set up across the country, where throat swabs were taken as the patient sat in their car. There are also walk-in centres have chambers that resemble a transparent phone box, where health workers take throat swabs using gloves built into the wall.[69]

[65] Hille, K. and White E. (2020) Containing coronavirus: lessons from Asia, Financial Times, 16th March 2020, https://www.ft.com/content/e015e096-6532-11ea-a6cd-df28cc3c6a68

[66] Hille, K. and White E. (2020) Containing coronavirus: lessons from Asia, Financial Times, 16th March 2020, https://www.ft.com/content/e015e096-6532-11ea-a6cd-df28cc3c6a68

[67] McCurry, J (2020) Test, trace, contain: how South Korea flattened its coronavirus curve. The Guardian. 23rd April 2020 https://www.theguardian.com/world/2020/apr/23/test-trace-contain-how-south-korea-flattened-its-coronavirus-curve

[68] Kennedy, J (2020) What can the UK learn from South Korea's response to COVID-19? April 7th 2020 https://chpi.org.uk/blog/what-can-the-uk-learn-from-south-koreas-response-to-covid-19/

[69] Sang-Hun, C. and Fisher M. (2020) How South Korea Flattened the Curve, New York Times, 23rd March 2020, https://www.nytimes.com/2020/03/23/world/asia/coronavirus-south-korea-flatten-curve.html

Testing is free and it is only a few hours before the results are returned by text message.[70]

Latest results from Our World in Data suggest that the South Korean Government has tested 11.98 per 1000 people or 614,197 in total as of 29th April 2020.

6.2.3 Comprehensive tracing using ICT

SK is also using innovative ICT approaches to track potential cases of COVID-19 using tools it developed in response to the MERS outbreak. This includes using a combination of CCTV footage, credit card data and past geolocation information to trace people's movements through cell towers, the purpose of which is to identify anyone who has come within two metres of a confirmed case in the 24 hours before the person began to display symptoms.[71] An anonymised version of the data is also disclosed to the public via alerts that are sent to smartphones in every district in which a confirmed case has travelled. The data is also used to deploy teams to disinfect locations where a confirmed case has been.[72]

The 'Centre for Health and Public Interest' who have examined SK's approach to testing and tracing describe how:

> *Across the country, people suspected of being exposed to the virus are contacted, tested and, if necessary, isolated. This process is carried out by the KCDCP in cooperation with local governments. People ordered into isolation must download a mobile phone app that allows the patient to communicate with health authorities and report their symptoms. It also alerts the authorities if someone breaks their isolation. The fine for violating* ***mandatory self-isolation*** *is between £1,900 and £6,500 or up to 1 year in jail.*[73]

Laws passed in 2015 post-MERS allow authorities to publish location information but the level of detail has raised questions about the privacy rights of its citizens.[74] While it is anonymised, in some cases the information has been sufficiently detailed for the public to find out the patients' identities.[75] The National Human Rights Commission of Korea, expressed concern that the "excessive disclosure of private information" could

[70] McCurry, J (2020) Test, trace, contain: how South Korea flattened its coronavirus curve. The Guardian. 23rd April 2020 https://www.theguardian.com/world/2020/apr/23/test-trace-contain-how-south-korea-flattened-its-coronavirus-curve

[71] Lee, A. (2020) If Bluetooth doesn't work for contact-tracing apps, what will? Wired, 17th April 2020 https://www.wired.co.uk/article/bluetooth-contact-tracing-apps

[72] Chan, H (2020) Pervasive personal data collection at the heart of South Korea's COVID-19 success may not translate. Thomsonreuters. 26th March 2020 https://blogs.thomsonreuters.com/answerson/south-korea-covid-19-data-privacy/

[73] Kennedy, J (2020) What can the UK learn from South Korea's response to COVID-19? April 7th 2020 https://chpi.org.uk/blog/what-can-the-uk-learn-from-south-koreas-response-to-covid-19/

[74] Zastrow, M (2020) South Korea is reporting intimate details of COVID-19 cases: has it helped? Nature. 18th March 2020 https://www.nature.com/articles/d41586-020-00740-y

[75] Joe E,A (2020) South Korea's Experiment in Pandemic Surveillance. The Diplomat. https://thediplomat.com/2020/04/south-koreas-experiment-in-pandemic-surveillance/ April 13th 2020

cause people with symptoms to avoid testing.[76] In response, the KCDCP said that such detailed location information should be released only when epidemiological investigations could not otherwise identify all the people with whom an infected person had been in contact before their diagnosis.

The KCDCP regularly updates its guidelines for pandemic surveillance in consultation with the public and it also has channels through which the public can petition to have their data amended if they do not agree with what has been recorded.[77]

SK recently recorded its first day (30th April 2020) with no locally transmitted cases of COVID-19 since the middle of February. While the country did record four new cases, they were all international travellers who were diagnosed and isolated on arrival.[78] This brings the country's total number of confirmed cases to 10,765. Officials however remain cautious and remain vigilant with regard to testing and tracing protocols.

6.3 New Zealand (NZ)

6.3.1 Overview

In total, 1,124 confirmed cases of COVID-19 have been reported in NZ with 19 deaths.[79] [80] The number of cases has recently slowed to single figures with only one confirmed case reported on the 26th April 2020.[81] Prime Minster, Jacinta Arden has also reported that the transmission rate is now less than half a person each.[82] As a result she announced that it has succeeded in stopping widespread, undetected community transmission of the virus and will begin a phased approach to lifting the strictest of its lockdown measures.[83] With a population of 5 million, the low levels of infection and low death rates, NZ's COVID-19 strategy has prompted worldwide attention.

[76] Thompson, D (2020) The Technology That Could Free America From Quarantine. The Atlantic April 7th 2020 https://www.theatlantic.com/ideas/archive/2020/04/contact-tracing-could-free-america-from-its-quarantine-nightmare/609577/

[77] Eun AJ (2020) South Korea's Experiment in Pandemic Surveillance. The Diplomat. April 13th 2020 https://thediplomat.com/2020/04/south-koreas-experiment-in-pandemic-surveillance/

[78] BBC News Website. Coronavirus and South Korea: How lives changed to beat the virus. 30th April 2020 Available at https://www.bbc.co.uk/news/world-asia-52482553

[79] Henley, J (2020) Don't judge Sweden's light touch on Covid-19 yet, says minister. The Guardian. Mon 27th April 2020 https://www.theguardian.com/world/2020/apr/27/dont-judge-swedens-light-touch-on-covid-19-yet-says-minister

[80] New Zealand Ministry of Health Website. COVID-19 - current cases. Available at: https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-current-situation/covid-19-current-cases

[81] BBC News Website. Coronavirus: New Zealand claims no community cases as lockdown eases. 27th April 2020 Available at: https://www.bbc.co.uk/news/world-asia-52436658 Accessed: 26th.04.20

[82] BBC News Website. Coronavirus lockdown: NZ to ease restrictions after 'stopping explosion' 20th April 2020 Available at: https://www.bbc.co.uk/news/world-asia-52350910 Accessed: 26th.04.20

[83] Anderson, C (2020) Ardern: New Zealand has 'won battle' against community transmission of Covid-19. The Guardian. 27th April 2020 https://www.theguardian.com/world/2020/apr/27/new-zealand-prepares-to-lift-strict-lockdown-after-eliminating-coronavirus

6.3.2 How has NZ succeeded?

Being a small Island nation in a remote location with borders that can be easily managed, all play to NZ's favour when it comes to managing the spread of COVID-19.[84] The country also had the benefit of a brief time-window to refine its planning with the first case of the virus not being confirmed until the 28th February 2020, a full month after the UK's first confirmed case.[85] However, the country's relative success has also been attributed to the decisiveness and cohesion of the government as well as a comprehensive 'elimination' strategy of strict lockdown measures combined with effective testing and tracing efforts.[86]

6.3.3 Multi stage lockdown strategy and tight border controls

The Lockdown strategy, which comprised of four levels, provided a blueprint of restrictive measures to eliminate the spread of the virus as well as steps to ease the country out of those measures. On the 23rd March 2020 when cases of community transmission were still at a relatively low level but on the increase, NZ's government announced it was instigating level four and imposing a strict national lockdown.[87] The lockdown required everyone except essential workers to stay home at all times, unless they were accessing vital services or walking for exercise. Citizens were also restricted to their own neighbourhoods.[88] All businesses except for essential services were closed and the country's borders were shut, except to returning citizens and residents, all of whom were required to quarantine or self-isolate for 14 days upon entry.[89]

Following a month at level four, on April 28th it was downgrading its response strategy to Level 3, lifting some of the stricter lockdown measures.[90] The expectation is that level three will remain in place for at least two weeks at which stage it will be reviewed.[91] Prime Minister Arden has said:[92]

[84] BBC News Website. Coronavirus: New Zealand claims no community cases as lockdown eases. 27th April 2020 Available at: https://www.bbc.co.uk/news/world-asia-52436658 Accessed: 26th.04.20

[85] Smyth, J (2020) New Zealand wins plaudits for coronavirus approach. Financial Times. 17th April 2020 https://www.ft.com/content/7514ea27-aff7-4733-a827-6ae792364f75

[86] BBC Website. Coronavirus: How New Zealand relied on science and empathy. 20th April 2020 Available at https://www.bbc.co.uk/news/world-asia-52344299 Accessed 27.04.20

[87] Hollingsworth, J (2020) How New Zealand 'eliminated' Covid-19 after weeks of lockdown. CNN. April 28th 2020 https://edition.cnn.com/2020/04/28/asia/new-zealand-coronavirus-outbreak-elimination-intl-hnk/index.html

[88] Graham-McLay, C (2020) Ardern optimistic as New Zealand records lowest number of Covid-19 cases for two weeks. The Guardian 8th April 2020 https://www.theguardian.com/world/2020/apr/08/ardern-optimistic-as-new-zealand-records-lowest-number-of-covid-19-cases-for-two-weeks

[89] Guina, Amy (2020) Why New Zealand's Coronavirus Elimination Strategy Is Unlikely to Work in Most Other Places. Time Magazine April 28th 2020 https://time.com/5824042/new-zealand-coronavirus-elimination/

[90] BBC News Website. Coronavirus: New Zealand claims no community cases as lockdown eases. 27th April 2020 Available at: https://www.bbc.co.uk/news/world-asia-52436658 Accessed: 26th.04.20

[91] Anderson, C (2020) Ardern: New Zealand has 'won battle' against community transmission of Covid-19. The Guardian. 27th April 2020 https://www.theguardian.com/world/2020/apr/27/new-zealand-prepares-to-lift-strict-lockdown-after-eliminating-coronavirus

[92] Hollingsworth, J (2020) How New Zealand 'eliminated' Covid-19 after weeks of lockdown. CNN. April 28th 2020 https://edition.cnn.com/2020/04/28/asia/new-zealand-coronavirus-outbreak-elimination-intl-hnk/index.html

(Level three) is not and cannot be returned to pre-Covid-19 life, That day will come, but it is not here yet.

6.3.4 An effective testing and tracing strategy

The lockdown measures have been paired with widespread testing for travellers and anyone who is suspected of being exposed to the virus, along with extensive contact tracing of their close contacts and subsequent isolation and quarantining practices.[93]

When the country announced it was imposing level four restrictions, its testing capacity was scaled up significantly to a high of 6961 on the 23rd April with 120 testing centres in operation.[94, 95] In total 126,066 tests have been conducted across the country.[96] This equates to a rate of 2,190 per 100,000 people. By comparison, SK, which also has widespread testing, has a rate of 1,140 per 100,000 people.[97]

Once a case is identified, that person's close contacts are tracked down and required to self-isolate. A contact-tracing workforce, the National Close Contact Service (NCCS), based at the Ministry of Health in Wellington began work on the 24th March 2020 (compare to the UK which has only now started to recruit contact tracers). The NCCS has traced 4909 close contacts to date with a record of 702 contacts traced in a single day.[98]

While the country has been using location tracking via text message to monitor overseas arrivals in self-isolation there has been no definitive answer yet as to whether public health units are going to use apps for contact-tracing.[99] Leading epidemiologists in the country are calling for this to be implemented as a necessary next step in ensuring control of the virus.[100]

To date, testing has focused on those who displayed symptoms of the virus, close contacts of any suspected or confirmed cases as well as inbound travellers. The country has subsequently loosened its testing criteria to allow for more widespread community testing, however some commentators have argued that this has not filtered

[93] Guinia, A (2020). Why New Zealand's Coronavirus Elimination Strategy Is Unlikely to Work in Most Other Places. Time Magazine April 28th 2020 https://time.com/5824042/new-zealand-coronavirus-elimination/

[94] Morton, J (2020) Coronavirus Covid 19: How is NZ's testing regime going? New Zealand Herald 9th April 2020 https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12323835

[95] New Zealand Ministry of Health Website. COVID-19 - current cases. Available at: https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-current-situation/covid-19-current-cases#lab Accessed: 28.04.20

[96] New Zealand Ministry of Health Website. COVID-19 - current cases. Available at: https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-current-situation/covid-19-current-cases#lab Accessed: 28.04.20

[97] Guinia, A (2020). Why New Zealand's Coronavirus Elimination Strategy Is Unlikely to Work in Most Other Places. Time Magazine April 28th 2020 https://time.com/5824042/new-zealand-coronavirus-elimination/

[98] Cheng, D (2020) Covid 19 coronavirus: 700 close contact traces a day but still no use of Bluetooth tracking. New Zealand Herald. 5th April 2020 https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12322565

[99] Morton, J (2020) Coronavirus Covid-19: Can smartphones help NZ stop spread? New Zealand Herald. 1st April 2020 https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12321607

[100] Cheng, D (2020) Covid 19 coronavirus: 700 close contact traces a day but still no use of Bluetooth tracking. New Zealand Herald. 5th April 2020 https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12322565

through at a clinician level with anecdotal reports that people are still being refused tests at centres unless they meet the original criteria.[101]

6.3 Germany

6.3.1 Overview

On 27th April 2020, the number of confirmed cases in Germany stood at 154,175 with 5,640 deaths.[102] This is significantly lower than the numbers being reported in other EU countries such as Spain, France and the UK. Germany also reported that they succeeded in bringing the reproduction factor — the number of people each person with the virus passes the infection to under 1.0 for the first time and lockdown restrictions were eased.[103] However, as of the 29th April 2020, this had rebounded to a value of 1.0 and Germany's chancellor Angela Merkel warned that a corresponding increase in infections would make a second "shutdown" unavoidable to prevent hospitals becoming overwhelmed.[104]

Commentators studying the German response to the virus highlight a combination of preparedness, rigorous testing and tracing strategies, along with a well organised health system as the key drivers of the country being in a better position than some of their EU counterparts.[105] At the same time, there are rising tensions across individual states with regard to the speed at which restrictions should be lifted. The federal government and experts within Germany continue to urge caution, repeatedly stressing that like other countries Germany is still in the early stages of the pandemic and that easing restrictions too early could result in a second wave.[106]

6.3.2 Collaboration between public and private industry

Germany's preparedness was helped by its early recognition that coronavirus was likely to become a global problem. It had developed a test even before the WHO had declared that the virus was transmissible from person to person.[107] This was aided by the strength of its biotech and pharmaceutical industry and the willingness of medical professionals and academics to work with private industry. The biotech company TIB

[101] Cheng, D (2020) Covid 19 coronavirus: Lockdown 'not enough', top professor tells Govt video conference. New Zealand Herald 31st March 2020 https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12321119

[102] Robert Koch Institute Website. Daily Situation reports in German an English. Available at: https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Situationsberichte/Gesamt.html Accessed 29.04.20

[103] Huggler, J (2020) What Germany got right in the fight against coronavirus. The Telegraph. https://www.telegraph.co.uk/news/2020/04/22/germany-got-right-fight-against-coronavirus/

[104] Moody, O (2020) Germany ready to tighten lockdown as coronavirus infection rate climbs again. The Independent. April 29 2020 https://www.thetimes.co.uk/article/germany-ready-to-tighten-lockdown-as-coronavirus-cases-climb-again-jgbsl5xp6

[105] Kuras, P (2020) No, Matt Hancock: biotech giants are not behind Germany's coronavirus success. The Guardian. 6th April 2020 https://www.theguardian.com/commentisfree/2020/apr/06/matt-hancock-biotech-germany-coronavirus-health-system

[106] Loxton R (2020) 'Orgies' and squabbling: Why Germany is not in control of the coronavirus pandemic as much as it appears. The LocalDE. https://www.thelocal.de/20200424/orgies-and-squabbling-why-germany-is-not-as-in-control-of-the-coronavirus-pandemic-as-it-appears

[107] Huggler, J (2020) What Germany got right in the fight against coronavirus. The Telegraph. https://www.telegraph.co.uk/news/2020/04/22/germany-got-right-fight-against-coronavirus/

Molbiol Syntheselabor GmbH worked alongside Berlin's Charite teaching hospital to produce a PCR testing kit based on SARs and other known coronaviruses. By the end of February 2020 it had supplied 1.4 million kits to the WHO and was making another 1.5 million a week.[108]

Germany also had a comprehensive testing policy in place from the outset. Test centres were rapidly established throughout the country in hospitals, GP practices and drive thru testing stations where anyone who displayed symptoms or had been in contact with a confirmed case could be tested as long as a doctor referred them. [109]

Medical staff are also regularly tested. To streamline the procedure, some hospitals have started doing **block tests**, using the swabs of 10 employees, and following up with individual tests only if there is a positive result.[110]

The country has continually scaled up its testing to the current level of 25.11 per 1000 people with over two million conducted by 19th April 2020.[111] To put this in context as of 26th April 2020 the level of testing in the UK was only 8.07 per 1000 people or 543,413 in total.[112]

As Germany has greatly expanded its criteria for testing, the German population have been correspondingly keen to be tested. As a result, the Robert Koch Institute (RKI) has indicated that too many asymptomatic individuals were being tested. The RKI called for an end to this practice on the grounds that Germany could risk running out of tests. Therefore, asymptomatic people are currently not being recommended for testing.[113]

Germany have also been quick to increase in the number of facilities processing tests, with the majority of tests being carried out in university, hospital and government laboratories, with private providers accounting for 36%.[114] It is estimated that over 200 laboratories are currently processing tests.[115]

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[108] Nicola, S (2020) A Berlin Biotech Company Got a Head Start on Coronavirus Tests. Bloomberg. 12th March 2020. https://www.bloomberg.com/news/articles/2020-03-12/a-berlin-biotech-company-got-a-head-start-on-coronavirus-tests

[109] Germany conducting more than 50,000 coronavirus tests a day https://www.ft.com/content/6a8d66a4-5862-4937-8d53-b2d10794e795

[110] Bennhold, K (2020) A German Exception? Why the Country's Coronavirus Death Rate Is Low 4th April 2020 https://www.nytimes.com/2020/04/04/world/europe/germany-coronavirus-death-rate.html

[111] Hasell, J et al (2020) Our World in Data website. To understand the global pandemic, we need global testing – the Our World in Data COVID-19 Testing dataset – Germany. Available at https://ourworldindata.org/covid-testing#germany. Accessed 01.05.2020

[112] Hasell, J et al (2020) Our World in Data website. To understand the global pandemic, we need global testing – the Our World in Data COVID-19 Testing dataset –United Kingdom. Available at https://ourworldindata.org/covid-testing#united-kingdom Accessed 01.05.2020

[113] Schumacher, E (2020). Germany's coronavirus response: Separating fact from fiction. 7th April 2020 https://www.dw.com/en/germanys-coronavirus-response-separating-fact-from-fiction/a-53053822

[114] Kuras, P (2020) No, Matt Hancock: biotech giants are not behind Germany's coronavirus success. The Guardian. 6th April 2020. https://www.theguardian.com/commentisfree/2020/apr/06/matt-hancock-biotech-germany-coronavirus-health-system

[115] Eckner, C (2020) How Germany has managed to perform so many COVID-19 tests. The Spectator. April 6th 2020 https://spectator.us/germany-managed-perform-covid-19-tests/

It is possible that Germany has managed to control the spread of the virus better than others through its policy of mass testing. However, commentators question whether Germany's mortality rate will look that much different to its European counterparts when the pandemic has abated.[116]

6.3.3 Extensive contact tracing

Alongside widespread testing, Germany also implemented a rigorous contact tracing system. Every person who has come into contact with an infected patient in the previous two weeks is tracked down and tested. While Germany has not announced the number of national tracers, anecdotal evidence from local media suggests a largescale effort.[117]

One major success example is from Heinsberg district, the epicentre of Germany's first major outbreak. A 47 year old male and his wife were identified as having the virus and were placed in isolation along with everyone who they had been in contact with in the previous two weeks. Given the couple had attended a carnival in the days leading up to testing positive, this involved a large scale operation tracing hundreds of attendees. The outbreak was contained and the district is now in the process of re-opening some shops.[118]

Germany is also in the process of developing an app tracing system to automate some of the contact tracing process. As in the UK, the development of such apps and whether the architecture should be 'centralised' or 'decentralised' has caused controversy.[119] Originally, Germany had favoured a centralised approach, however privacy concerns and the announcement by both google and apple that they were backing the 'decentralised' approach instigated the government to announce that it is switching to a decentralised architecture.[120]

6.3.3. Antibody Testing

Germany is the first European country to carry out large-scale COVID-19 antibody testing. It is hoped that this will provide more information on how many people have antibodies, at what levels, and what protection they offer against the virus. The RKI has announced that the study will take place in three phases, the first of which will examine samples from people who have donated blood.[121] The second phase will focus on samples from regions with large coronavirus outbreaks and a third stage will consist of

[116]Münchau, W (2020) Germany's testing success looks real — for now. Financial Times. April 5th 2020. https://www.ft.com/content/849308f8-75bc-11ea-ad98-044200cb277f

[117] Roberts, L (2020) Contact tracing: how has it worked for other countries, and could it really help ease UK lockdown? The Telegraph https://www.telegraph.co.uk/news/0/contact-tracing-uk-lockdown/

[118]Huggler, J (2020) What Germany got right in the fight against coronavirus. The Telegraph. 30th April 2020. https://www.telegraph.co.uk/news/2020/04/22/germany-got-right-fight-against-coronavirus/

[119] Roberts, L (2020) Contact tracing: how has it worked for other countries, and could it really help ease UK lockdown? The Telegraph https://www.telegraph.co.uk/news/0/contact-tracing-uk-lockdown/

[120]Lomas, N (2020) Germany ditches centralized approach to app for COVID-19 contacts tracing. Tech Crunch. April 27th 2020 https://techcrunch.com/2020/04/27/germany-ditches-centralized-approach-to-app-for-covid-19-contacts-tracing/

[121]McLaughlin, K (2020) Germany is conducting Europe's first nationwide COVID-19 antibody testing. April 22nd 2020 https://www.businessinsider.com/germany-covid-19-antibody-testing-nationwide-2020-4?r=US&IR=T

a representative study of the country's broader population. Authorities say they will examine about 5,000 blood samples every 14 days, with initial results expected in May 2020.[122]

6.3.4 A robust public healthcare system and decentralised decision making

Germany's robust healthcare system has been highlighted as key to their ability to cope with the virus and its federal political system appears to be a factor too. It devolves power over large areas of health policy - including testing - away from central government to state level and below. This created more autonomy and flexibility to coordinate the work of different laboratories.[123]

6.4 France, Italy and Spain

6.4.1 Overview

France, Italy and Spain have all displayed some of the highest infection and mortality rates globally.[124] A lack of a comprehensive testing and contact tracing strategies combined with relatively late lockdowns are being viewed as significant contributors. Recently, all three countries have experienced a slowdown in the rate of new infections.

However as they begin to move out of the strictest lockdown measures, public health authorities and government agencies have stressed that the need for economies to restart must be balanced with the risks of new outbreaks and further shutdowns.

Mass testing and tracing, (specifically antibody testing to measure the extent of the disease in the community) combined with continued social distancing and public health measures are key to the exit strategy of all three countries.

6.4.2 France's U-turn on testing

Issues with implementing a comprehensive testing schedule in France emerged early on. Commentators pointed to the limited logistical capacity to undertake mass testing due to a relatively small number of accredited laboratories as well as the limited availability of SARS-COV-2 reagents for the antigen tests.[125]

[122] Schmitz (2020) Germany Is Conducting Nationwide COVID-19 Antibody Testing. NPR website. Available at: https://www.npr.org/sections/coronavirus-live-updates/2020/04/21/839594202/germany-is-conducting-nationwide-covid-19-antibody-testing

[123] Bennhold, K (2020) A German Exception? Why the Country's Coronavirus Death Rate Is Low, April 4th 2020, https://www.bbc.co.uk/news/health-52234061

[124] John Hopkins University and Medicine Coronavirus Resource Centre. (2020) Mortality Analysis. https://coronavirus.jhu.edu/data/mortality

[125] Moatti, JP (2020) The French response to COVID-19: intrinsic difficulties at the interface of science, public health, and policy. Lancet Public Health https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(20)30087-6/fulltext April 7th 2020 https://doi.org/10.1016/ S2468-2667(20)30087-6

French authorities did not believe that systematic testing was needed once the virus had achieved high levels of community transmission and only those who are considered to be at-risk, i.e. elderly care home residents, healthcare staff and pregnant women were being tested and only if they showed symptoms.

This policy was reversed on 28th March 2020, with the acknowledgement that mass testing and tracing would be key to managing a way out of the current lockdown. The government announced that anyone who is displaying symptoms can be tested as long as they have been seen by a GP. The government is aiming to carry out 700,000 tests per week.[126] The tests will also be available for people who have had 'close contact' with a confirmed case of COVID- 19 and the costs of the test will be fully covered by the public health system.[127]

As soon as a person has tested positive, anyone who they have been in contact with will also be identified and tested even if they are asymptomatic and will be asked to self-isolate until test results can be confirmed.[128] French authorities have set up local "brigades" of investigators to track the trail of infection, estimating they will test 20 contacts per infection or 420,000 tests a week.[129]

Along with several other European countries, the French government are also in the process of developing an app alert system, which would warn users if they come into contact with anyone infected with the virus. The use of an app has proved somewhat divisive among French political parties and the public due to possible privacy violations.[130] For now, their main focus is on a manual testing and tracing strategy.

6.4.3 Spain – expanded testing

Similar to the situation in France, Spain's ability to instigate a mass testing campaign was called into question at the early stages of the pandemic. While there was some capability to manufacture tests locally other components needed to carry out the tests were in short supply. The limited capability of diagnostic labs was also highlighted.[131] As a result, up until the beginning of April 2020 only those infected or suspected of having Covid-19 were being tested.

Since the week beginning 6th April 2020, Spain has significantly expanded its testing strategy with a specific focus on asymptomatic carriers of the virus who are working in

[126] The Connexion Website (2020) Key questions as France aims for 700,000 Covid tests. 20th April 2020. Available at: https://www.connexionfrance.com/French-news/Key-questions-as-France-aims-for-700-000-Covid-19-tests-by-deconfinement-on-May-11

[127] BBC News Website. Coronavirus: France mandates masks for schools and transport. 28th April 2020 https://www.bbc.co.uk/news/world-europe-52459030

[128] France24 Website. Key points of France's strategy for lifting its nationwide Covid-19 lockdown. 29th March 2020. Available at: https://www.france24.com/en/20200429-key-points-of-france-s-strategy-for-lifting-its-nationwide-covid-19-lockdown

[129] BBC New Website. Coronavirus: France mandates masks for schools and transport. 28th April 2020. Available at: https://www.bbc.co.uk/news/world-europe-52459030

[130] Dillet, R (2020) France postpones parliament debate on contact-tracing app. Tech Cruch. 28th April 2020 https://techcrunch.com/2020/04/28/france-postpones-parliament-debate-on-contact-tracing-app/

[131] GÜELL, O et. Al (2020) Lack of testing hampering Spain's efforts to slow coronavirus outbreak. El Pais. 18th March 2020 https://english.elpais.com/society/2020-03-18/lack-of-testing-hampering-spains-efforts-to-slow-coronavirus-outbreak.html

essential services such as healthcare employees, workers in senior residences, police, delivery workers and staff from the food supply chain. The government view this sector of the population as forming an important part of the transmission chain of the virus that needs to be interrupted. [132]

To cope with the increased level of testing, the health minister has stated that Spanish companies are manufacturing 240,000 test kits per week and are boosting capacity to produce more, while equipment is also being bought from abroad to increase diagnostic capabilities.[133]

In addition, the government have been preparing infrastructure so that confirmed cases can be isolated to prevent further spread of infection. The plan is similar to the so-called Noah's Ark hospitals, which China successfully used to isolate mild Covid-19 cases and halt the spread of the virus. Spain's regions were asked to draw up a list of public and private infrastructure that could be used to house those infected who cannot isolate at home but do not require hospitalisation. This could also include the asymptomatic positives. While use of these facilities will be voluntary and only for those who need it, the government is considering its legal options where someone refuses to comply with isolation measures.[134]

A further tool that the Health Ministry announced at the end of April 2020 is a serological survey with antibody testing on 36,000 households. The objective is to determine the real number of people who have been infected in the country, and potentially, how much of the population is immune to the disease.[135]

The tests will be carried out in primary healthcare centres, unless a home visit is essential. They are located across Spanish territory and cover all age sectors from the population pyramid in a proportional manner. Around 90,000 people in total will be tested. This survey will be carried out alongside increased diagnostic testing which the government states is still the cornerstone of its testing strategy'.[136]

6.4.4 Italy

It has been reported that Italy failed to put together a comprehensive strategy of testing, tracking and isolation and that is a significant factor leading to its second

[132] Marcos, J (2020) Spanish government preparing centers to isolate asymptomatic Covid-19 patients. El Pais 6th of April https://english.elpais.com/society/2020-04-06/spanish-government-preparing-centers-to-isolate-asymptomatic-covid-19-patients.html

[133] RTE News (2020) Spain plans to widen testing for Covid-19 as death rate continues to drop. Available at: https://www.rte.ie/news/2020/0406/1128795-spain-to-widen-testing-for-covid-19-as-death-rate-drops/ Accessed 30.04.20

[134] Marcos, J (2020) Spanish government preparing centers to isolate asymptomatic Covid-19 patients. El Pais 6th of April https://english.elpais.com/society/2020-04-06/spanish-government-preparing-centers-to-isolate-asymptomatic-covid-19-patients.html

[135] DW Website. Coronavirus: Spain presents lockdown exit strategy. 28th April 2020. Available at: https://www.dw.com/en/coronavirus-spain-presents-lockdown-exit-strategy/a-53266436 Accessed 30.04.2020

[136] Linde, P (2020) Spain will begin de-escalation of coronavirus measures without knowing the incidence of the epidemic. El Pais. 22nd April 2020 https://english.elpais.com/society/2020-04-22/spain-will-begin-deescalation-of-coronavirus-measures-without-knowing-the-incidence-of-the-epidemic.html?rel=mas

highest number of deaths globally, superseded only by the USA.[137] However, its strict lockdown has seen the number of cases ebbing and Italy believes its contagion rate -- reported at between 0.2 and 0.7 -- is low enough below 1.0 to attempt moving the country towards less restrictive lockdown measures.[138]

As with Germany and France, antibody testing has commenced. A largescale antibody testing programme has begun in Lombardy, where almost half of Italy's deaths have occurred.[139] Italian health authorities have said 20,000 tests would be performed every day with those in hardest hit provinces first to be tested, specifically health workers, those under quarantine showing coronavirus symptoms, their close contacts as well as others with mild symptoms. Authorities hope to roll out the tests to the wider region after the 29th April. Any antibody tests will be complemented by swab diagnostic tests to confirm a patient's status.[140]

Two other Italian regions, Veneto and Emilia-Romagna have been testing 100,000 doctors and nurses for antibodies since late March in an effort to build up an army of medical staff with potential immunity to work in the most infected isolation wards. The regions hope to follow this by rolling out of antibody testing to the general population.[141]

6.5 Sweden

6.5.1 Overview

Sweden is presently an outlier in terms of its handling of the pandemic. It has stopped short of implementing many of the strict emergency measures seen in its Scandinavian neighbours, Denmark and Norway. While it has closed senior schools and banned gatherings of more than 50, the government has asked – rather than ordered – people to avoid non-essential travel, work from home and stay at home, if they are elderly or ill.[142] As a result the government has left shops, restaurants and gyms open, with the expectation that the public will act responsibly, adapting activities to minimise the risk of spreading. Restaurants, bars and cafés throughout the country have also been instructed to take special measures.[143]

[137] Giugliano, F (20200 The Lessons from Italy's Covid-19 Mistakes. Bloomberg News. March 23rd 2020 https://www.bloomberg.com/opinion/articles/2020-03-23/italy-s-covid-19-trial-and-error-and-lessons-for-france-and-u-k

[138] France24 Website. Italy unveils plan for life after Covid-19 lockdown. Available at: https://www.france24.com/en/20200426-italy-unveils-plan-for-life-after-covid-19-lockdown Accessed: 30.04.2020

[139] Europost Website. Italy starts antibody tests for virus immunity in Lombard. 23rd April 2020 Available at: https://europost.eu/en/a/view/italy-starts-antibody-tests-for-virus-immunity-in-lombardy-28348

[140] MacKenzie, J and Fraser, A (2020) Lombardy becomes latest Italian region to start own coronavirus tests. April 23rd 2020 https://www.reuters.com/article/us-health-coronavirus-italy-testing/lombardy-becomes-latest-italian-region-to-start-own-coronavirus-tests-idUSKCN2251YH

[141] Squires, N (2020) Italy starts antibody testing to find people who have developed Coronavirus Immunity. The Times 3rd April 2020 https://www.telegraph.co.uk/news/2020/04/03/italy-starts-antibody-testing-immune-covid-19/

[142] Reynolds, E. (2020) Sweden says its coronavirus approach has worked. The numbers suggest a different story. April 29th 2020 https://edition.cnn.com/2020/04/28/europe/sweden-coronavirus-lockdown-strategy-intl/index.html

[143] Henly, J (2020) Don't judge Sweden's light touch on Covid-19 yet, says minister. The Guardian. 27th April 2020 https://www.theguardian.com/world/2020/apr/27/dont-judge-swedens-light-touch-on-covid-19-yet-says-minister

Anders Tegnell, the country's chief epidemiologist, has stated that it is important for a good portion of the community to acquire immunity by contracting the virus. The UK and the Netherlands initially considered this approach until models suggested it would result in huge numbers of deaths.[144]

The Swedish approach has led to international debate over whether the country has adopted a sensible and sustainable model, or exposed its population to unnecessary risk and deaths.[145]

The approach of the Swedish government has drawn some criticism from the medical and scientific community in Sweden. A petition signed by more than 2000 doctors, scientists and academics called on the government for stricter measures.[146] A leading researcher at the Karolinska Institute stated[147]:

> *We're not testing enough, we're not tracking, we're not isolating enough – we have let the virus loose….they are leading us to catastrophe*

A leading doctor at a major hospital in Sweden stated that the current approach would

> *probably end in a historical massacre.*[148] ,[149]

It would appear that some of these concerns are being realised with Sweden's death toll of 2,586 (over half of which occurred in care homes) comparing unfavorably to their Nordic neighbours Denmark (452 deaths) and Norway (207 deaths).[150]

However, there are signs that Sweden is willing to moving towards enforcing more stringent measures, with the Prime Minister Stefan Lofven proposing an emergency law for the rapid closure of schools, public areas and transportation if the situation worsens.[151] Stockholm authorities have also started to shut down pubs and restaurants that have failed to observe the social distancing recommendations.[152]

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[144] What We Can Learn from Six Countries' Pandemic Battle Plans. The Tyee, https://thetyee.ca/News/2020/04/13/What-We-Can-Learn-From-Six-Countries-Pandemic-Plans/

[145] Savage, M (2020) Coronavirus: Has Sweden got its science right?. BBC News 25th April 2020 https://www.bbc.co.uk/news/world-europe-52395866

[146] Godon, M (2020) Sweden's Relaxed Approach to the Coronavirus Could Already Be Backfiring. Time Magazine. April 9th 2020. https://time.com/5817412/sweden-coronavirus/

[147] Robertson D. (2020) 'They are leading us to catastrophe': Sweden's coronavirus stoicism begins to jar, The Guardian, 30th March 2020, https://www.theguardian.com/world/2020/mar/30/catastrophe-sweden-coronavirus-stoicism-lockdown-europe

[148] Godin, M (2020) Sweden's Relaxed Approach to the Coronavirus Could Already Be Backfiring. Time Magazine. April 9th 2020. https://time.com/5817412/sweden-coronavirus/

[149] Reynolds, E (2020) Sweden says its coronavirus approach has worked. The numbers suggest a different story. CNN. 29th April 2020 https://edition.cnn.com/2020/04/28/europe/sweden-coronavirus-lockdown-strategy-intl/index.html

[150] Laurent, L (2020) No, Sweden Isn't a Miracle Coronavirus Model, Bloomberg Opinion. 1st May 2020. https://www.bloomberg.com/opinion/articles/2020-05-01/covid-19-sweden-hasn-t-cracked-the-coronavirus-code

[151] Habib, H (2020) 'I've never written so many death certificates': Is Sweden having second thoughts on lockdown? The Independent. Monday 13th April 2020 https://www.independent.co.uk/news/world/europe/sweden-coronavirus-lockdown-doctor-death-certificates-latest-a9462796.html

[152] Henly, J (2020) Don't judge Sweden's light touch on Covid-19 yet, says minister. The Guardian. 27th April 2020 https://www.theguardian.com/world/2020/apr/27/dont-judge-swedens-light-touch-on-covid-19-yet-says-minister

6.5.2 Shifting testing priorities in Sweden reflect pattern of other EU countries

As in many EU countries and in the UK, during the early stage of the pandemic in Sweden, tests were carried out on anyone who reported symptoms after travel to high-risk regions, displayed symptoms of pneumonia without a known cause or had contact with confirmed cases. Authorities also used contact tracing to track the movements of confirmed cases in order to contact others who might have been exposed to the virus and test them where necessary.[153]

Initially, all tests were carried out at Sweden's high-containment laboratory in Solna but in order to increase testing capacity, testing also began at eight clinical medical laboratories spread out across the country. [154]

Similar to other countries, Sweden's strategy of testing, tracing and isolating cases changed once broad community transmission had been identified and only those who were displaying symptoms were tested. Later, the Public Health Agency recommended that testing should be expanded to include health or elderly care workers who are displaying symptoms, those who are severely ill and need hospital care as well as those in high-risk groups.

By the 26th April 2020, Sweden had carried out 11.8 tests per 1000 people and around 119,200 tests. **[155]** Prime Minister Stefan Löfven has said that he views testing as crucial to tracking the progress of the disease and hoped to be testing 100,000 people a week by the end of April.[156]

A recent antibody study carried out by the Swedish Public Health Agency estimated that:

- 26% of the Stockholm population would have been infected by the May 1st 2020;[157] and
- For each confirmed case, there were around 999 milder cases not recorded because people did not seek medical help.[158]

[153] Edwards, C (2020) Fact check: Has Sweden stopped testing people for the coronavirus? The Local SE. 20th March 2020 https://www.thelocal.se/20200320/fact-check-has-sweden-stopped-testing-people-for-the-coronavirus.

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[155] Hasell, J et al (2020) Our World in Data website. To understand the global pandemic, we need global testing – the Our World in Data COVID-19 Testing dataset – Sweden https://ourworldindata.org/covid-testing#sweden

[156] Riansy, S (2020) Comparing Sweden's Covid-19 testing with other countries in Europe. The Brussels Times. 23rd April 2020 https://www.brusselstimes.com/opinion/107000/comparing-swedens-covid-19-testing-with-others-in-europe/

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[158] Kim, S (2020) Scientist Behind Sweden's Coronavirus Strategy Says Country Better Prepared For Second Wave Due to Not Having Lockdown, Newsweek. 24th April 2020 https://www.newsweek.com/coronavirus-second-wave-sweden-lockdown-herd-immunity-covid-19-1500046

7. Conclusion

The WHO has regularly advised that countries should take a comprehensive approach to tackling the pandemic through testing, contact tracing, quarantining and social distancing. It highlights the importance of a robust testing programme and what this should comprise – to find, test, isolate and care for cases and quarantine contacts.

Differences in the testing policies of countries have been highlighted in the success or otherwise of minimising the transmission of the virus. South Korea (SK), New Zealand (NZ) and Germany have been highlighted as being very successful with their regimes of testing, followed by rigorous contact tracing and the quarantine/self-isolation of close contacts. However, NZ and Germany had 'lockdown' policies; South Korea did not impose such draconian measures.

Until the end of March 2020, the majority of tests in the UK had been done on seriously ill hospital patients with symptoms of the virus. Throughout April, all regions of the UK have been ramping up diagnostic tests for healthcare and other key workers and vulnerable groups. This lack of testing compared to other countries appears largely to have been due to lack of capacity at the time. Only with the increasing capacity to test now available can the UK look to implement a substantial regime of testing and contact tracing in the hope of easing out of 'lockdown'.

Experts, academics and scientists across the world are continually working on and publishing developments and proposals with regards to testing – both for improvements to the current tests for the virus and for antibody tests to check whether someone is likely to be immune having recovered from the virus. Germany is the first European country to carry out large-scale COVID-19 antibody testing, others are following suit. It is hoped that this will provide more information on how many people have antibodies, at what levels, and what protection they offer against the virus. The UK does not yet have the capacity to do widespread antibody testing but recent media reports indicate that potentially this should become available in the near future.