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COVID-19

Background, Public Health Measures and Testing for SARS-CoV-2

This Briefing Paper has been prepared to support the NI Assembly Ad-Hoc COVID-19 Committee. It provides some introductory background information on COVID-19 and then focuses on the policies and actions taken in the UK and other selected countries regarding tackling the pandemic, focusing on public health measures and testing of individuals.

Coronavirus disease 2019 (COVID-19) is the infectious disease caused by the coronavirus - 'severe acute respiratory syndrome coronavirus 2' (SARS-CoV-2).

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1. Background to COVID-19

The recent coronavirus outbreak was first identified in the city of Wuhan, in the Hubei province of China. Initial reports to the World Health Organisation (WHO) identified 44 cases between 31st December 2019 and 3rd January 2020 for 'pneumonia of unknown etiology'.¹

Several days later the coronavirus SARS-CoV-2 was isolated and identified as the virus causing the disease named COVID-19². The origin of infection is thought to be from the Huanan seafood and live animal market with animal to person spread and then subsequent transmission occurring through person-to-person contact.³

On 11th March 2020, the WHO formally classed the outbreak as a pandemic.⁴ As of the 30th March 2020, the WHO stated that there were 203 'countries, areas or territories' with confirmed cases; 754,958 'confirmed cases' and 36,571 deaths around the world attributed to COVID 19.⁵ Presently, more than a quarter of all the people on the planet are living under some kind of restrictions in their social contact and movements.⁶

Coronaviruses are a large family of viruses that are common in people and many different species of animals, including camels, cattle, cats, and bats. Rarely, animal coronaviruses infect people and then spread between people such as with MERS-CoV, SARS-CoV, and now with this new virus SARS-CoV-2. All three of these viruses have their origins in bats. The genetic sequences isolated from patients in the US are similar to the one that China initially released, suggesting a likely, recent emergence of this new virus from an animal reservoir.⁷

Researchers are now actively investigating the animal origin of SARS-CoV-2. Bats are known carriers of the latest strain of the disease, but scientists believe the disease did not jump straight from bats to human but first passed through another animal intermediary.⁸

¹ Gorbalenya, et.al. (2020) Severe acute respiratory syndrome-related coronavirus: The species and its viruses – a statement of the Coronavirus Study Group, <https://www.biorxiv.org/content/10.1101/2020.02.07.937862v1.full.pdf>

² World Health Organisation, Naming the coronavirus disease (COVID-19) and the virus that causes it, [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-\(covid-2019\)-and-the-virus-that-causes-it](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it)

³ Centers for Disease Control and Prevention, US, COVID-19 Emergence, https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/summary.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsummary.html

⁴ Coronavirus confirmed as pandemic by World Health Organization, BBC News, 11th March 2020, <https://www.bbc.co.uk/news/world-51839944>

⁵ WHO, COVID-19 Outbreak Situation, <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>

⁶ Coronavirus: The Month that Changed Everything, BBC News, 28th March 2020, <https://www.bbc.co.uk/news/stories-52066956>

⁷ Centers for Disease Control and Prevention, US, COVID-19 Emergence, https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/summary.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fsummary.html

⁸ Pangolins may have spread coronavirus to humans, The Guardian, 7th February 2020, <https://www.theguardian.com/world/2020/feb/07/pangolins-might-have-spread-coronavirus-to-humans>

2. Incubation Period and Symptoms of COVID-19

The incubation period range of the virus is believed to be between 1-14 days, with a standard quarantine period of 14 days being used for individuals with suspected infections. People with COVID-19 generally develop symptoms on an average of 5-6 days after infection.⁹

Symptoms range from mild to severe and most commonly present as fever, cough and shortness of breath. COVID-19 is a lower respiratory tract infection, which means that most of the symptoms are felt in the chest and lungs. This is different from colds that bring on an upper respiratory tract infection, where a runny nose and sinus congestion is common. Those symptoms seem to be mostly absent for people with COVID-19, though they are not unheard of in the course of the disease.

The most detailed breakdown of symptoms comes from a recent WHO analysis of more than 55,000 confirmed cases in China. The most common symptoms and the percentage of people who had them in that group are¹⁰:

- Fever: 88%
- Dry cough: 68%
- Fatigue: 38%
- Coughing up sputum, or thick phlegm, from the lungs: 33%
- Shortness of breath: 19%
- Bone or joint pain: 15%
- Sore throat: 14%
- Headache: 14%
- Chills: 11%

Nausea or vomiting, stuffy nose, diarrhoea, coughing up blood and swollen eyes were reported at much lower levels (5% or less).

3. Testing Patients for SARS-CoV-2

Differences in the testing policies of countries have been highlighted in the success or otherwise of minimising the transmission of the virus. So, before looking at the various

⁹ Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19), <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>

¹⁰ Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19), <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>

policies and actions being taken in a range of countries to tackle the pandemic, it is useful to understand how patients are tested to confirm they have the virus.

There are two main reasons for testing people for the presence of SARS-CoV-2 (virus that causes the illness COVID-19). Firstly, to diagnose them individually as patients or as healthcare professionals, and secondly to try to understand how far the virus has spread in the wider population. This second reason is referred to as 'surveillance testing' and is not yet being widely undertaken in the UK.

The test used to detect the active presence of the virus in an individual uses molecular diagnosis with a method called 'real-time RT-PCR (RdRp gene) assay' using samples taken from patients. The science behind the test is complex but involves technicians in the laboratories looking for genetic sequences specific to the coronavirus in the patient's sample. Because the virus's genome is made of RNA, this involves first turning the RNA into DNA.¹¹

Results can be available in a number of hours but it can take longer than this to get results back to the clinician, as tests are being performed in a limited number of laboratories.

When a clinician suspects novel coronavirus, they take swab samples from the nose, throat and deeper respiratory tract and send them for testing. Scientists can look for evidence of the presence of any type of coronavirus and then hone in on specific genetic clues that identify the novel coronavirus associated with this outbreak. In the UK, a confirmatory test is conducted at Public Health England's main Colindale laboratory.¹²

In the UK, NHS England and NHS Improvement have published guidance and standard operating procedures for COVID-19 testing for use in all laboratory settings, including the information flows to support the management of patient results. The regional network of laboratories are in the following locations¹³: Scotland, Northern Ireland, Wales, London, Cambridge, Birmingham, Bristol, Manchester, Leeds, Newcastle; and Southampton

In addition to processing samples from suspected cases in the UK, PHE is now working as a reference laboratory for the World Health Organisation (WHO), testing samples from countries that do not have assured testing capabilities.

¹¹ 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/>

¹² PHE novel coronavirus test rolled out across UK, Public Health England, News, <https://www.gov.uk/government/news/phe-novel-coronavirus-diagnostic-test-rolled-out-across-uk>

¹³ 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>

4. Policies and Actions in Selected Countries

4.1 Overview

By the 13th March 2020, the WHO had stepped up its calls for intensified action to fight the coronavirus pandemic. Across the world, governments have implemented a range of measures to decrease contact between people to slow transmission of the virus - closed schools, sealed borders, cancelled cultural and sporting events and imposed tough social distancing measures. In addition, some countries have implemented extensive testing regimes. The WHO director general has stressed that countries should take a comprehensive approach¹⁴:

Not testing alone, not contact tracing alone. Not quarantine alone. Not social distancing alone. Do it all. Find, isolate, test and treat every case, to break the chains of transmission ... do not just let this fire burn.

Countries have taken a range of measures and the following sections will look at a selection of countries, including the UK and Republic of Ireland, and at examples further afield at both ends of the response spectrum. These range from the strict social measures and extensive testing of the patients and wider population in Germany and South Korea to Sweden, where at present life is going on closer to normal.

4.2 UK

The UK Government (including the NI Executive) have focused on policy and actions to reduce day-to-day contact between people (social distancing) and supporting the health service. It introduced three key measures on 23rd March 2020 for everyone to follow (see 4.2.2 below). The government will keep the measures under review; the first review is due three weeks after the start date.

4.2.1 UK - Coronavirus Legislation

It was quickly envisaged that changes to legislation would be needed in order to give public bodies across the UK the tools and powers they need to carry out an effective response to this emergency. The emergency legislation, *Coronavirus Act 2020*, received Royal Assent on 25th March 2020.¹⁵ The Act¹⁶:

- Increases the available health and social care workforce by removing barriers to allow recently retired NHS staff and social workers to return to work;
- Eases the burden on frontline staff by reducing the number of administrative tasks they have to perform, enabling local authorities to prioritise care for

¹⁴ '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>

¹⁵ Coronavirus Act 2020, <http://www.legislation.gov.uk/ukpga/2020/7/section/87/enacted>

¹⁶ What the Coronavirus Bill will do, Department of Health and Social Care, <https://www.gov.uk/government/publications/coronavirus-bill-what-it-will-do/what-the-coronavirus-bill-will-do#contents-of-the-bill>

people with the most pressing needs and allowing key workers to perform more tasks remotely and with less paperwork;

- Containing and slowing the virus by reducing unnecessary social contacts, for example through powers over events and gatherings, and strengthening the quarantine powers of police and immigration officers;
- Managing the deceased with respect and dignity by enabling the death management system to deal with increased demand for its services; and
- Supporting people by allowing them to claim Statutory Sick Pay from day one, and by supporting the food industry to maintain supplies.

Section 87 of the Act allows for The Welsh and Scottish Ministers and NI Departments to make Regulations in connection with the provision of this Act.¹⁷ In NI, these regulations are entitled *The Health Protection (Coronavirus, Restrictions) (Northern Ireland) Regulations 2020* and came into force on the 28th March 2020. The Department of Health (NI) considers that the restrictions and requirements imposed by these Regulations are proportionate to achieving the public health response to the coronavirus pandemic in NI.¹⁸

4.2.2. UK – Social Distancing and Related Measures

The key social distancing and related measures are now summarised from the Cabinet Office document and apply across the UK¹⁹:

- Requiring people to stay at home, except for very limited purposes. These are:
 - shopping for basic necessities, for example food and medicine, which must be **as infrequent as possible**;
 - one form of exercise a day, for example a run, walk, or cycle - alone or with members of your household;
 - any medical need, including to donate blood, avoid or escape risk of injury or harm, or to provide care or to help a vulnerable person;
 - travelling for work purposes, but **only** where you **cannot** work from home - If you cannot work from home then you can still travel for work purposes, provided you are not showing coronavirus symptoms and neither you nor any of your household are self-isolating.

¹⁷ Coronavirus Act 2020, Section 87, Commencement, <http://www.legislation.gov.uk/ukpga/2020/7/section/87/enacted>

¹⁸ The Health Protection (Coronavirus, Restrictions) (Northern Ireland) Regulations 2020, <https://www.health-ni.gov.uk/publications/health-protection-coronavirus-restrictions-northern-ireland-regulations-2020>

¹⁹ Staying at home and away from others (social distancing), Updated March 29th 2020, Cabinet Office, <https://www.gov.uk/government/publications/full-guidance-on-staying-at-home-and-away-from-others/full-guidance-on-staying-at-home-and-away-from-others>

(NB - These reasons are all **exceptions** - even when doing these activities, you should be minimising time spent outside of the home and ensuring you are two metres apart from anyone outside of your household).

This implies that schools, colleges and universities are closed and indeed the Department of Education has confirmed that schools, pre-schools and statutory nurseries closed at the end of the day on Friday 20th March for all pupils and children in NI.²⁰

- Closing certain businesses and venues. They include:
 - pubs, cinemas and theatres;
 - **all retail** with some notable exceptions (closures include clothing and electronics stores; hair, beauty and nail salons; and outdoor and indoor markets, excluding food markets);
 - libraries, community centres, and youth centres;
 - indoor and outdoor leisure facilities such as bowling alleys, arcades and soft play facilities;
 - communal places within parks, such as playgrounds, sports courts and outdoor gyms;
 - places of worship, except for funerals attended by immediate families;
 - hotels, hostels, bed and breakfasts, campsites, caravan parks, and boarding houses for commercial/leisure use, excluding permanent residents, key workers and those providing emergency accommodation, for example for the homeless; and
- Stopping all gatherings of more than two people in public – exceptions to this rule:
 - where the gathering is of a group of people who live together, for example a parent can take their children to the shops if there is no alternative;
 - where the gathering is essential for work purposes - but workers should try to minimise all meetings and other gatherings in the workplace; and
 - funerals, which can be attended by immediate family only.

Further information for employers and tradespeople includes:

- Employers who have people in their offices or onsite should ensure that employees are able to follow all Public Health England guidelines;

²⁰ Education Authority, School Closures, <https://www.eani.org.uk/parents/school-closures>

- Work carried out in people's homes by tradespeople can continue, provided that the tradesperson is well and has no symptoms. They should maintain a two-metre distance from any household occupants;
 - No work should be carried out in any household which is isolating or where an individual is being shielded, unless it is to remedy a direct risk to the safety of the household, such as emergency plumbing or repairs;
 - No work should be carried out by a tradesperson who has coronavirus symptoms and at all times, workers should follow the guidance on self-isolation if they or anyone in their household shows symptoms.

The relevant authorities, including the police, have now been given the powers to enforce the measures, including through fines and dispersing gatherings. This includes instructing people to take steps to stop their children breaking these rules if children have done so; and taking people home or arresting them, if they do not follow police instructions or where they deem it necessary.

The police have been instructed to act with discretion and common sense. However, if the police believe that you have broken these rules, or if a person refuses to follow their instructions, a police officer may issue a fixed penalty notice for £60 (reduced to £30 if paid within 14 days). For a second penalty notice, the amount will increase to £120 and double on each further repeat offence.

There is separate government advice for individuals or households who are isolating, and for the most vulnerable who need to be shielded.²¹ Where parents do not live in the same household, children under 18 can move between their parents' homes. House moves should be delayed unless it is unavoidable.

The Government has also identified a number of critical workers whose children can still go to school or their childcare provider.

Critical public services – such as social services and support for victims should be provided and accessed remotely whenever possible, but you can leave the house to access them when physical attendance is absolutely necessary.

A business or venue operating in contravention with these measures will be committing an offence leading to prohibition notices and fixed penalty notices. Local authorities (for example, Environmental Health and Trading Standards officers) will monitor compliance, with support from the police.

4.2.3 UK – Testing for Coronavirus

As of 31st March 2020, 134,946 people in the UK had been tested for coronavirus. The UK government says there is now capacity to carry out 11,000 tests a day. However, it has only been testing 7,000 people a day so far, with a total of around 9,000 separate

²¹ Self-isolation advice, NHS, <https://www.nhs.uk/conditions/coronavirus-covid-19/self-isolation-advice/>

swabs (some people need more than one test). It hopes to carry out 25,000 tests a day by mid-April, with further ramping up to 250,000 tests a day being the ultimate aim.²² The majority of these tests have been on seriously ill hospital patients with symptoms of the virus.²³

Specific to NI, Health Minister Robin Swann told the NI Assembly on 24th March that there was an aim to rise to 900 tests a day in NI by the next week. He stated that two additional health trusts would also start testing this week up to 250 tests a day, meaning NI would have the capability to test about 1,100 people a day.²⁴

The current guidance from PHE is that those patients that meet the following criteria are being tested²⁵:

- Those patients requiring admission to hospital (a hospital practitioner has decided that admission to hospital is required with an expectation that the patient will need to stay at least one night); **and**
 - have either clinical or radiological evidence of pneumonia; or
 - acute respiratory distress syndrome; **or**
 - influenza like illness (fever $\geq 37.8^{\circ}\text{C}$ and at least one of the following respiratory symptoms, which must be of acute onset: persistent cough (with or without sputum), hoarseness, nasal discharge or congestion, shortness of breath, sore throat, wheezing, sneezing.

Guidance states that clinicians should also consider testing inpatients with new respiratory symptoms or fever without another cause or worsening of a pre-existing respiratory condition. The guidance also covers the infection control steps that clinicians should take to assess a patient in the first instance and while awaiting test results, including the **minimum** Personal Protection Equipment (PPE) that should be used.²⁶

PHE has stated that it will do some surveillance testing on a local level if clusters of cases are identified, using a network of 100 designated GP surgeries.

²² Culbertson, A. (2020), Coronavirus: UK plans to buy antibody tests which may be 'gamechanger' in fighting COVID-19 spread, Sky News, 20 March 2020, <https://news.sky.com/story/coronavirus-uk-plans-to-buy-antibody-tests-which-may-be-gamechanger-in-fighting-covid-19-spread-11960554>

²³ Schraer, R. (2020), Coronavirus: Is the UK testing enough people? <https://www.bbc.co.uk/news/health-51943612>

²⁴ Coronavirus restrictions 'will last more than three weeks', BBC News, NI Politics, 24th March 2020, <https://www.bbc.co.uk/news/uk-52012915>

²⁵ 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>

²⁶ 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>

A press briefing held in Downing Street on 16th March 2020 stated that NHS staff would be given access to testing for COVID-19.²⁷ It was a key concern of many that healthcare workers not being widely tested meant they could spread the infection unknowingly and that some may end up self-isolating unnecessarily.

In line with this, Sir Simon Stevens, Chief Executive Officer of the NHS, confirmed on 27th March, 2020 that a testing programme to support the retention of NHS staff could now begin in England. Firstly, for those working in critical care, emergency departments and ambulance services. These tests are for staff who are unable to work because of the requirement for 14-day self-isolation as they are currently living in a household where another individual may have COVID-19 as it is this group that is causing the greatest degree of absenteeism.²⁸

In Wales, frontline NHS staff are already being tested for the virus. Scotland is already testing some NHS staff but plans to increase tests. Testing in NI had been limited to patients and some health care workers, but it plans to start testing healthcare staff from 30th March onwards.²⁹

Professor Jonathan Ball, a molecular virologist at the University of Nottingham, believes the current testing regime does not go far enough:

there has to be more widespread testing out in the community.... We need to get a handle on where the virus is circulating most and better inform people of the cause of their respiratory symptoms, so that self-isolation is better informed and more likely to be enacted.

4.3 Republic of Ireland

Similarly, to across the UK, public health measures have been implemented in the Republic of Ireland and these will be reflected in the regulations to be made under the *Health (Preservation and Protection and Other Emergency Measures in the Public Interest) Act 2000*³⁰ and will be enforced by the Garda Síochána.

Until 12 April, everyone in the RoI is urged to stay in their home wherever possible, except in the following situations³¹:

- To travel to and from work where the work is considered an essential service;

²⁷NHS staff 'can access covid-19 testing', government insists, Health Service Journal (HSJ), Workforce, 16th March 2020, <https://www.hsj.co.uk/workforce/nhs-staff-can-access-covid-19-testing-government-insists/7027133.article>

²⁸ Letter: COVID-19 testing to support retention of NHS staff, 29th March 2020, <https://www.england.nhs.uk/coronavirus/publication/letter-covid-19-testing-to-support-retention-of-nhs-staff/>

²⁹ Coronavirus: Testing rolled out for frontline NHS staff, <https://www.bbc.co.uk/news/uk-52072568>

³⁰ Health (Preservation and Protection and Other Emergency Measures in the Public Interest) Act 2000, <https://www.oireachtas.ie/en/bills/bill/2020/3/>

³¹ Public Health Measures in place until April 12 to prevent spreading COVID-19, 28th March 2020, Department of Health and Department of the Taoiseach, Irish Government, <https://www.gov.ie/en/publication/cf9b0d-new-public-health-measures-effective-now-to-prevent-further-spread-o/>

- Working in an essential shop, bank or post office;
- To attend medical appointments and collect medicines and other health products for yourself, your family or someone who is vulnerable or 'cocooning'
- For vital family reasons including caring for children, elderly or vulnerable people but excluding social family visits;
- To exercise within two kilometres of your house. You cannot exercise with people from outside your household; and
- Everyone who can work from home must work from home. This includes essential workers and workers in essential government, utilities or other functions.

In the RoI, widespread testing is key to the government's plan to control the pandemic. By 24th March there was backlog of around 40,000 people awaiting testing but the plan is to ramp up the testing capacity to 15,000 per day. RoI's testing figures compare relatively well to other European countries. Its rate of 1,350 tests per million of the population so far lags Austria and Germany, but is ahead of the UK and France. It is some way off South Korea, considered among the best testing regimes in the world. However, the original strategy of widespread 'community testing' of those with symptoms created a huge demand for testing when on 13th March³²:

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.

The policy has since been revised somewhat and is clearly laid out in a Health Service Executive document outlining current eligibility for testing (last updated on 1st April 2020). The following information is taken from that document³³:

In the RoI, you can now phone your GP to be assessed for a test in any of these situations:

- If you are in a priority group and have - fever and a cough, or fever and shortness of breath (breathing difficulties);
- If you are in a priority group and have been in contact with someone you think or know has coronavirus and you have any of these symptoms: Cough, congestion, runny nose, sore throat, body aches, tiredness

The Priority Groups are:

³² 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>

³³ HSE Testing for COVID-19, 01/04/2020, <https://www2.hse.ie/conditions/coronavirus/testing.html#Priority-groups>

- 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;
 - those most at risk of severe infection such as people with diabetes, immunosuppressed, chronic lung disease, chronic heart disease, cerebrovascular disease, chronic renal disease, chronic liver disease and smokers;
 - people who live with those in the above groups;
 - staff and residents of nursing homes and other residential care settings and those in direct provision, homeless, Roma and travelling community settings where symptom management is difficult;

The document clearly lays out how the appointment will be made, how and where the test will take place (at home, a community test centre or drive-thru centre), if the GP decides that the individual need to be tested, and also instructions for precautions to take while waiting for the test.

4.4 Germany

On 22nd March 2020, Germany increased its range of measures to decrease social contacts. Earlier measures had been in place from 12th March. The measures now are very similar to those in place in the UK, with necessary work, emergency care, shopping, visits to the doctor, individual sports and exercise as well as other necessary activities remaining possible³⁴:

- Citizens are encouraged to reduce contacts to other people outside their own household to an absolutely necessary minimum;
- Wherever possible, a minimum distance of at least 1.5 m must be maintained in public from people;
- Spending time in public space is only permitted on your own, with another person who does not live in the household or with members of your own household;
- Groups of people celebrating in public places, in homes and private facilities are unacceptable;

³⁴ Extension of the agreed guidelines on the limitation of social contacts, Coronavirus in Germany, <https://www.bundesregierung.de/breg-de/themen/coronavirus/besprechung-der-bundeskanzlerin-mit-den-regierungschefinnen-und-regierungschefs-der-laender-1733248>

- Restaurants are closed. This does not apply to the delivery and collection of take-away meals for consumption at home;
- Service companies in the field of personal care are closed. Medically necessary treatments remain possible; and
- All companies must comply with the hygiene regulations and implement effective protective measures for employees and visitors.

Germany has been consistently highlighted as having a much lower death rate (0.6%) from COVID-19 (to this point in time) than many other countries, for example, Italy's rate is around 10% at present and the UK's is almost 5%. There are several explanations³⁵:

- How the case fatality rate is calculated - the rate is produced by dividing the number of deaths by the total number of confirmed cases, therefore if a country only tests seriously ill patients (as in the UK at present) they will have a higher case fatality rate. In the early stages of the disease Germany carried out thousands of tests and implemented rigorous contact tracing and this allowed it to identify substantially more cases of the disease than other countries;
- Carrying out more tests - by testing people who might have been exposed to the disease, Germany has been able to identify cases of coronavirus quicker and isolate people who have been infected. Germany has tested around 12,000 people per day.³⁶ This has helped prevent the disease from being spread to vulnerable groups;
- Fewer older people were initially infected - in Germany, just 20% of patients confirmed to have the disease are aged over 60 - compared to around 50% in Spain. The initial concentration of the disease among younger people in Germany appears to have been because many of those infected were people returning from skiing holidays in Italy and they then infected people of a similar age. The death rate may increase as more older people become infected; and
- Number of acute care hospital beds available - Germany has a high level of acute care hospital beds (621 per 100,000 people), meaning that they will have been immediately more able to cope with an influx of additional patients.

In terms of moving forward, a research project being carried out at the Helmholtz Centre for Infection Research in Braunschweig in the coming weeks will conduct blood tests to look for antibodies produced against the novel coronavirus in the general public. The test will give researchers a better idea of how many people have contracted the virus without knowing. The antibody test will indicate that the test participants have

³⁵ Udale-Smith, A. and Garcia, C. A. (2020), Coronavirus: Why Germany has such a low COVID-19 death rate, Sky News, 26th March 2020, <https://news.sky.com/story/coronavirus-why-germany-has-such-a-low-covid-19-death-rate-11964051>

³⁶ Sanchez Nicolas E. (2020) EU countries unable to follow WHO's call for mass testing, EU Observer, Brussels, 20th March 2020, <https://euobserver.com/coronavirus/147830>

already had the virus and are thereby ready to re-enter society and the workforce. The researchers plan to issue 'immunity certificates' to those who have overcome the virus.³⁷

4.5 South Korea

This section will focus on the response in South Korea, however, the measures implemented there are common to a number of Asian countries. These included early travel restrictions, aggressive testing and screening of contacts and strict quarantine rules. Universal healthcare and clear management structures for the public health response also helped. Such measures have contained the virus in Taiwan and Singapore and slowed infection rates in South Korea, Hong Kong and Japan. Some health experts believe that Asia's democracies such as South Korea provide better models for epidemic management in Western countries, rather than looking to China with its very different political system:³⁸

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.

The backbone of South Korea's response has been mass testing, followed by rigorous contact tracing and the quarantine of anyone the carrier has come into contact with. As of March 19th 2020, the country has conducted more than 307,000 tests, the highest per capita in the world.³⁹

The following information is extracted from an article in the New York Times, which outlines how South Korea has 'flattened the curve'⁴⁰:

To spare hospitals and clinics from being overwhelmed, officials opened 600 testing centers designed to screen as many people as possible...and keep health workers safe by minimizing contact.

At 50 drive-through stations, patients are tested without leaving their cars. They are given a questionnaire, a remote temperature scan and a throat swab.... Test results are usually back within hours. At some walk-in centers, patients enter a chamber resembling a transparent phone booth.

³⁷ Wighton, D. and Chazan D. (2020), Germany will issue coronavirus antibody certificates to allow quarantined to re-enter society. Researchers to test thousands for immunity as Berlin plans exit strategy for pandemic lock down, The Telegraph, 29th March 2020, <https://www.telegraph.co.uk/news/2020/03/29/germany-will-issue-coronavirus-antibody-certificates-allow-quarantined/>

³⁸ 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>

³⁹ Bedingfield, W. (2020), What the World Can Learn from South Korea's Coronavirus Strategy, Wired, Health, 21st March 2020, <https://www.wired.co.uk/article/south-korea-coronavirus>

⁴⁰ 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>

Health workers administer throat swabs using thick rubber gloves built into the chamber's walls.

When someone tests positive, health workers carry out aggressive contact tracing using methods developed during the previous MERS⁴¹ outbreak, after which its laws were revised to prioritise social security over individual privacy at times of infectious disease crises. Security camera footage, credit card records, GPS data from patients' cars and cell-phones are used to retrace movements and find contacts:

As the coronavirus outbreak grew too big to track patients so intensively, officials relied more on mass messaging - South Koreans' cellphones vibrate with emergency alerts whenever new cases are discovered in their districts. Websites and smartphone apps detail hour-by-hour, sometimes minute-by-minute, timelines of infected people's travel — which buses they took, when and where they got on and off, even whether they were wearing masks. People who believe they may have crossed paths with a patient are urged to report to testing centers.

In addition, the South Korean healthcare system is a highly regulated system, which has been prepared in recent years to face epidemics. The country failed to contain the 2015 outbreak of Middle East respiratory syndrome (MERS), recording 186 cases and 38 deaths, more than anywhere outside the Middle East. After which the country overhauled their response to respiratory infections, fast-tracking the production of test kits and equipping hospitals with infection control units and negative pressure rooms. The population were shaken by the MERS outbreak and are also more to comply with all the public health measures - likely to wash their hands, stay at home and get tested if requested to.⁴²

4.6 Sweden

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. Schools remain open in Sweden but universities have closed. The Prime Minister defended the present set of measures⁴³:

We all, as individuals, have to take responsibility. We can't legislate and ban everything.... It is also a question of commonsense behaviour.

⁴¹ MERS – Middle East Respiratory Syndrome, <https://www.cdc.gov/coronavirus/mers/index.html>

⁴² 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>

⁴³ Orange, R. (2020), As the rest of Europe lives under lockdown, Sweden keeps calm and carries on, The Guardian, <https://www.theguardian.com/world/2020/mar/28/as-the-rest-of-europe-lives-under-lockdown-sweden-keeps-calm-and-carries-on>

The basic public health measures currently in place in terms of minimising infection spread are similar to but seem less definitive than most other EU countries⁴⁴:

- Stay home if you feel sick with symptoms such as sniffing, coughing or fever, even if the symptoms are mild;
- Avoid visiting older relatives and do not make unnecessary visits to elderly care homes or hospitals and not at all if you feel ill;
- Avoid unnecessary trips e.g. weekend trips especially to cities, mountain resorts or other holiday destinations;
- Employers who have the option of letting employees work from home may consider recommending that;
- Wash your hands with soap and warm water frequently; and
- Avoid social contacts if you are over 70 years old - the guidance also reminds those over 70 that they are of higher risk with underlying diseases, such as high blood pressure, cardiovascular disease, lung disease, or diabetes.

The following more specific measures have recently been implemented but are much less draconian than in the UK and other EU countries⁴⁵:

- From 29th March, public gatherings and public events may have a maximum of 50 participants;
- Sports and exercise may continue, but certain precautions are needed to reduce the risk of spreading e.g. reduce close contact, do not share water bottles, mouthguards and similar, avoid crowding, e.g. when letting people in. Training, matches and local cups have not been cancelled due to the epidemic. Gyms, swimming pools and sports halls are open. However, activities are to be adapted to minimise the risk of spreading;
- From 25th March restaurants, bars and cafés throughout the country have needed to take special measures - guests may only eat and drink sitting at a table or pick up takeaway, standing at a bar is not allowed, takeaway can be handed over as usual as long as it takes place without crowding between people.

⁴⁴ Current and confirmed information about the coronavirus, Krisinformation.SE, <https://www.krisinformation.se/en/hazards-and-risks/disasters-and-incidents/2020/official-information-on-the-new-coronavirus>

⁴⁵ Current and confirmed information about the coronavirus, Krisinformation.SE, <https://www.krisinformation.se/en/news/2020/march/public-health-agency-of-sweden-ban-on-crowding-in-restaurants-cafes-and-bars/>

Media reports indicate that many Swedes are taking matters into their own hands by reducing their use of public transport, keeping their children off school and moving to home working.⁴⁶

The Swedish public health authorities have released simulations to guide “surge requirements”. From these, it is clear that the Swedish government anticipates far fewer hospitalisations per 100,000 of the population than predicted in other countries, including Norway, Denmark and the UK. However, the corresponding number of deaths in Sweden predicted using UK simulations are much higher than the Swedish government’s simulations suggest⁴⁷:

Swedish authorities believe there are many infected people without symptoms and that, of those who come to clinical attention, only one in five will require hospitalisation. At this point, it is hard to know how many people are asymptomatic as there is no structured screening in Sweden and no antibody test to check who has actually had COVID-19 and recovered from it. But substantially underestimating hospital surge requirements would nevertheless be devastating.

Many within Sweden’s scientific and medical community are starting to raise concerns about the approach. A petition signed by more than 2000 from that community has called for more stringent containment methods. A leading researcher at the Karolinska Institute stated⁴⁸:

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.

5. Testing – International Comparisons and Recent Developments

In total, 1,881 people per million UK citizens had been tested as of 29 March 2020, compared with almost 6,000 tests per million in Germany. It has been commented that if the UK was using all of its molecular virology labs to process tests, it could come closer to Germany’s level of testing. The UK government announced on 27th March that it would begin drawing on the laboratory capacity of universities and research institutes.⁴⁹

The UK is also lagging behind comparable countries like Italy, the US and South Korea when it comes to how many tests are being carried out per million people. Italy, whose

⁴⁶ Nickel, D. (2020) Why Sweden’s Coronavirus Approach is so Different from Others, Forbes, Coronavirus Dispatches, <https://www.forbes.com/sites/davidnickel/2020/03/30/why-swedens-coronavirus-approach-is-so-different-from-others/#7cecead4562b>

⁴⁷ Franks, P. W. and Nilsson, P. M. (2020), Sweden under fire for ‘relaxed’ coronavirus approach – here’s the science behind it, <https://theconversation.com/sweden-under-fire-for-relaxed-coronavirus-approach-heres-the-science-behind-it-134926>

⁴⁸ 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>

⁴⁹ Schraer, R. (2020), Coronavirus: Is the UK testing enough people? <https://www.bbc.co.uk/news/health-51943612>

outbreak is a fortnight ahead of the UK, had tested 7,513 people per million on 29 March and had tested 2,283 people per million at a similar point in its outbreak. However, the UK has tested more than Japan, where the rate is currently 257 per million (32,497 people in total).⁵⁰

Many European countries face testing shortages and some health authorities across the continent believe that those who do not show any symptoms have no reason to be tested. For example, Finland's head of health security stated⁵¹:

We don't understand the WHO's instructions for testing. We can't fully remove the disease from the world anymore.... those who can be sick at home, won't benefit from testing.... We are not doing as many tests as possible but rather when needed.

Experts and academics are now continually working on and publishing developments and proposals with regards to testing. The following are a selection of the most recent.

Dr Justin O'Grady (Quadram Institute, Norwich), in collaboration with microbiologist Jonathan Edgeworth (Guy's and St Thomas's NHS Foundation Trust, London), stated that he is working on a portable coronavirus test kit that takes 50 minutes from sample to result and could be used in an anteroom off a hospital ward to test NHS staff. It is hoped it will be available within weeks.⁵²

A team from the University of Oxford's Engineering Science Department and the Oscar Suzhou Centre for Advance Research (OSCAR) have been working to improve on the current testing process in terms of speed and equipment needed. They state that their new test produces accurate results in half an hour and that its sensitivity enables it to identify the virus earlier and using simpler equipment. The test has been trialled on 16 clinical samples in Shenzhen Luohou People's Hospital in China and achieved a 100% diagnostic success rate in that trial.⁵³

In addition (as already mentioned for Germany) scientists are working towards a test to see whether someone has already had COVID-19, by checking blood samples for the presence of the antibodies produced by the body to fight off the virus. This would help work out how widespread COVID-19 has been and whether people are safe to go back into society. The Prime Minister, Boris Johnson, stated that negotiations are currently ongoing and the kits would be bought if the tests prove effective.⁵⁴

⁵⁰ Schraer, R. (2020), Coronavirus: Is the UK testing enough people? <https://www.bbc.co.uk/news/health-51943612>

⁵¹ Sanchez Nicolas E. (2020) EU countries unable to follow WHO's call for mass testing, EU Observer, Brussels, 20th March 2020, <https://euobserver.com/coronavirus/147830>

⁵² Coronavirus: portable kit to test NHS staff for virus to be 'available in weeks', The Independent, Health News, 21st March 2020, <https://www.independent.co.uk/news/uk/home-news/coronavirus-portable-kit-nhs-staff-testing-supplies-a9414281.html>

⁵³ Porter, S (2020), UK Scientists Develop 30 minute test kit for COVID-19, HealthcareIT News, <https://www.healthcareitnews.com/news/europe/uk-scientists-develop-30-minute-test-kit-covid-19>

⁵⁴ Culbertson, A. (2020), Coronavirus: UK plans to buy antibody tests which may be 'gamechanger' in fighting COVID-19 spread, Sky News, 20 March 2020, <https://news.sky.com/story/coronavirus-uk-plans-to-buy-antibody-tests-which-may-be-gamechanger-in-fighting-covid-19-spread-11960554>

There is also a need to look to the future and determine an 'exit strategy' from the current 'lockdown' in the UK. One expert in the field of epidemiology commented on 31st March, that detecting who is immune through the planned antibody test will not necessarily end 'lockdown'. He proposes a range of alternatives for consideration⁵⁵:

- Wait for a vaccine, which will take at least a year, and continue with a severe lockdown until then;
- Gradually relax lockdowns and let the pandemic run its course slowly, which China and Taiwan have done and the UK seems to be planning. However, he proposes that this method would lead to around 200,000 deaths in the UK;
- His preferred approach - weekly testing of whole populations for presence of virus (the current test), with immediate quarantine of infectious people and their contacts. This would allow the lockdown to be released while protecting lives and controlling the epidemic.

The practicalities of the last approach would see every household in the UK receiving and returning self-sample nasal and throat swabs every week in barcoded tubes - about 10m tests per day would be needed:

This seemingly impossible feat may be possible if every polymerase chain reaction (PCR) machine in the country is diverted to 24-hour testing...Every biology department in every university has dozens of PCRs; the genome project at the Wellcome Sanger Institute has thousands....

6. Conclusion

The WHO director general has regularly advised that countries should take a comprehensive approach to tackling the pandemic through testing, contact tracing, quarantining and social distancing.

Differences in the testing policies of countries have been highlighted in the success or otherwise of minimising the transmission of the virus. The UK lags behind comparable countries like Italy, the US and South Korea when it comes to how many tests are being carried out per million people.

The majority of tests in the UK have been on seriously ill hospital patients with symptoms of the virus. The UK is only now starting to test healthcare workers. This is in stark contrast to many Asian countries, for example South Korea. The backbone of

⁵⁵ Peto, J. (2020), How to ramp up Covid-19 testing immediately in the UK, Financial Times, Opinion, Coronavirus, 31st March 2020, <https://www.ft.com/content/02a2bece-72b5-11ea-90ce-5fb6c07a27f2>

South Korea's response has been mass testing, followed by rigorous contact tracing and the quarantine of anyone the carrier has come into contact with.

Experts, academics and scientists are now continually working on and publishing developments and proposals with regards to testing – both for improvements to the current tests for the virus and for a future antibody test to check whether someone is likely to be immune having recovered from the virus.

The paper has also highlighted the range of public health and social distancing measures taken across the UK and in the Republic of Ireland. It has also looked at examples further afield at both ends of the response spectrum - from the strict social measures and extensive testing of the patients and wider population in Germany and South Korea to Sweden, where at present life is going on closer to 'normal'.