



BRIEFING PAPER

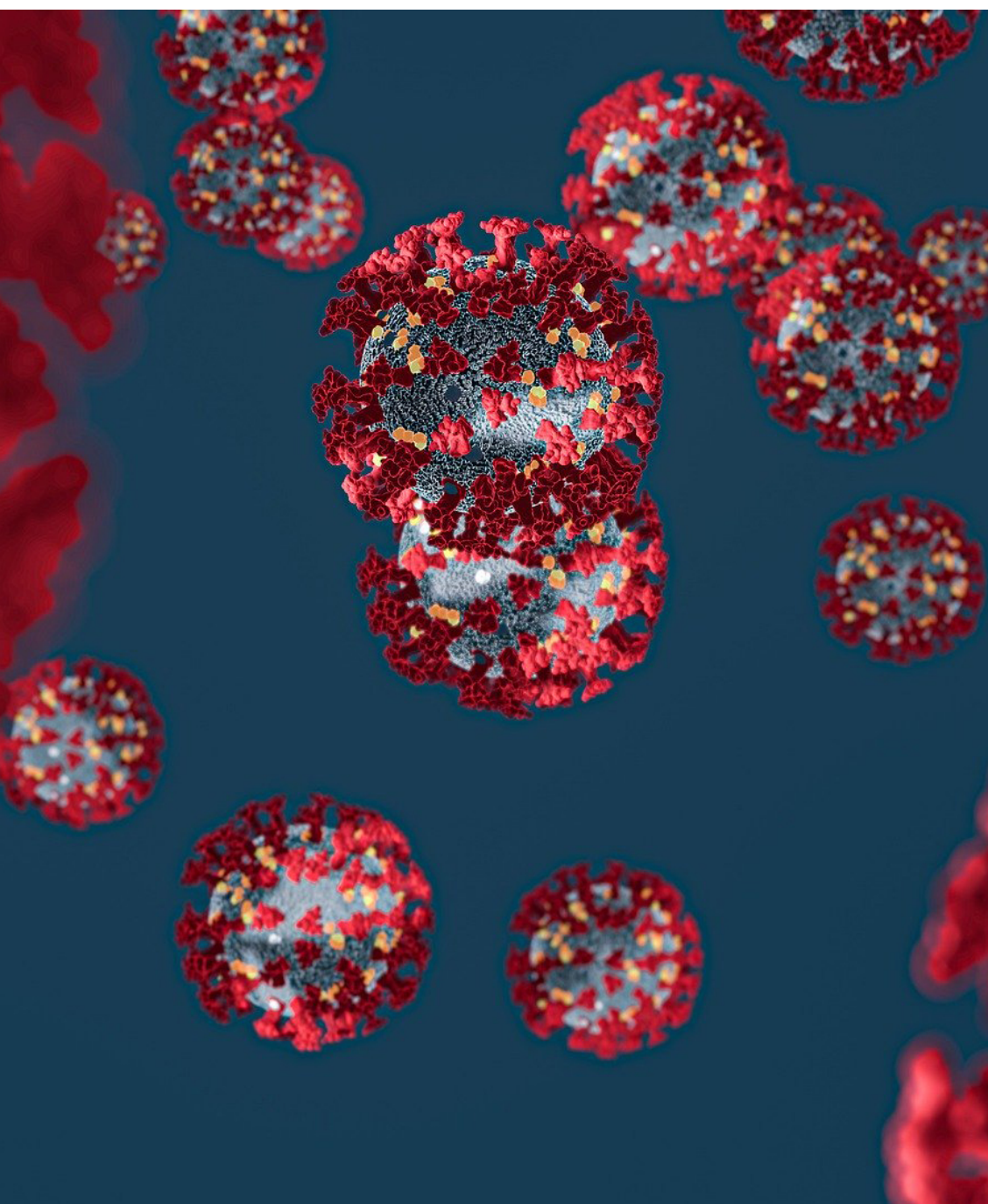
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Coronavirus: Testing for Covid-19

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1. Why test for Covid-19?
2. Testing capacity
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Summary

The World Health Organization (WHO) has strongly encouraged countries to test suspected cases of Covid-19 disease to disrupt the transmission of the SARS-CoV-2 virus and slow the rate of infection. Testing can also help support public health efforts to 'characterise' the disease, so that health authorities can understand its severity, prevalence and how it is evolving.

The NHS is using an RT-PCR test to identify cases of Covid-19 in the UK. This relies on collecting genetic material (RNA) from the suspected case via a nose and/or throat swab to detect nucleic acid from the virus. The PCR test can only detect the virus while it is present in the person; it cannot tell if the person has had the virus but has since recovered. The test may also not identify those cases where the person is infected but is not showing symptoms.

'Serological tests' for Covid-19 are currently in development. These tests aim to identify whether the individual has previously had the virus – even if they have not shown symptoms – through using a blood or plasma sample to detect if the patient has antibodies to the virus. The Government is reported to have bought options on up to 17.5 million antibody tests, of different types, that could be used 'at home' rather than in a clinical setting. The effectiveness of the 'at home' tests is currently being evaluated. To date, they have not performed well, generating both false negatives and false positives.

Testing capacity for Covid-19 in England has increased during the course of the outbreak, rising from 2,000 tests per day on 5 March 2020 to 12,799 by 4 April 2020 and to approximately 38,000 by 17 April 2020. The approach to testing has also shifted from a centralised system (where tests were processed by Public Health England laboratories) to a more distributed approach that relies on NHS laboratories, private industry and academia/research institutes. On the 2 April, the Health Secretary pledged that testing capacity would increase to 100,000 tests a day by the end of the month. The Government has been subject to criticism for not scaling up the UK's testing capacity earlier, and more rapidly, and for failing to prepare sufficiently for the pandemic. Several reasons have been cited as to why testing capacity is not higher, including shortages of the key materials that are needed to perform and run the tests.

At the start of the outbreak, the UK pursued a testing and contact tracing policy which aimed to 'contain' the virus and disrupt transmission through testing suspected cases and following up with the close contacts of those who tested positive. As the UK moved from the 'contain' to 'delay' phase of its response to the virus on the 12 March, the criteria for testing narrowed to only the most severe cases, primarily:

- 1 all patients in critical care for pneumonia, acute respiratory distress syndrome (ARDS) or flu like illness;
- 2 all other patients requiring admission to hospital for pneumonia, ARDS or flu like illness and;
- 3 where an outbreak has occurred in a residential or care setting, for example long-term care facility prisons.

Following sustained criticism that NHS staff were not being tested, the Government announced on the 27 March that testing would be extended to frontline NHS staff in England. On 15 April, the Government pledged that staff working in care homes in England requiring a test would be able to access one and that all symptomatic care home residents will also be tested for Covid-19.

1. Why test for Covid-19?

The World Health Organization (WHO) has repeatedly advocated for the testing of suspected Covid-19 cases to be an integral part of each country's response to the disease. Speaking on 13 March 2020, the Director General of the WHO, Dr Tedros Adhanom Ghebreyesus, [explained](#) why “aggressive testing and contact tracing combined with social distancing measures and community mobilisation” – was vital to curb infections:

You can't fight a virus if you don't know where it is. Find, isolate, test and treat every case to break the chains of transmission. Every case we find and treat limits the expansion of the disease.¹

The WHO Director General [reiterated](#) this “simple message” on the need for testing three days later:

the most effective way to prevent infections and save lives is breaking the chains of transmission. And to do that, you must test and isolate. You cannot fight a fire blindfolded. And we cannot stop this pandemic if we don't know who is infected. We have a simple message for all countries: test, test, test. Test every suspected case. If they test positive, isolate them and find out who they have been in close contact with up to 2 days before they developed symptoms, and test those people too [if they show symptoms of COVID-19].²

Testing (and contact tracing) for Covid-19 among people displaying symptoms of the disease is thus advocated by the WHO for multiple, inter-connected reasons. It is a means to identify who has the disease, so that effective care and isolation measures can be put in place. Such measures can also prevent the infected person coming into contact with, and potentially infecting, others, thereby helping to disrupt the transmission of the virus and slow the rate of infection. Researchers at [Imperial College](#), London, estimated that each case of Covid-19 in Wuhan, China, infected an average of 2.6 other people, prior to control measures being implemented.³ Breaking the cycle of transmission would require a reproduction rate of less than 1.

By slowing the rate of infection in a region or country, the peak number of coronavirus cases is expected to be both lower and spread over a longer period of time. The WHO notes that this should help to avoid a significant surge of critical cases that risk overwhelming health services, an approach sometimes referred to as ‘flattening the curve’.⁴ [Testing](#) can also help support public health efforts to “characterise the trajectory and severity of the disease”, so that health authorities can understand its prevalence and how it is evolving.⁵

¹ World Health Organization, [Covid-19 press conference transcript](#), 13 March 2020

² World Health Organization, [WHO Director-General's opening remarks at the media briefing on COVID-19](#), 16 March 2020

³ MRC Centre for Global Infectious Disease Analysis, [Report 3 - Transmissibility of 2019-nCoV](#), 22 January 2020

⁴ World Health Organization, [WHO Director-General's opening remarks at the media briefing on COVID-19](#), 18 March 2020

⁵ M Lipsitch et al, Defining the Epidemiology of Covid-19 — Studies Needed, [New England Journal of Medicine](#) 2020; 382:1194-1196

1.1 What types of test for Covid-19 are used in the UK?

RT-PCR

The NHS is using an RT-PCR test (reverse transcription polymerase chain reaction) which relies on collecting genetic material (RNA) from the suspected case via a nose and/or throat swab to detect nucleic acid from the virus SARS-CoV-2.⁶ According to the Government, testing in most laboratories currently [takes](#) “24-48 hours from the time a sample arrives [due to] the numbers received and [because] handling the COVID-19 specimens safely involves a complex laboratory process”.⁷ The Deputy Chief Medical Officer, Dr Jenny Harries, explained in March that the test “will either say that you are negative or presumed positive, and then there will be a further test that is sent off to a reference laboratory to confirm the test”.⁸

The PCR test, however, can only detect the virus while it is present in the person; it cannot tell if the person has had the virus but has since recovered. The Government Chief Scientific Adviser (GCSA), Sir Patrick Vallance, has also noted that the PCR test may not pick up those cases where the person is infected, but is not showing symptoms. When giving evidence to the Health and Social Care Select Committee, Sir Patrick told Members that these were two important limitations of the PCR test:

all we can do at the moment is detect somebody who has the active virus that they are shedding. There is some evidence that, if you are asymptomatic and you are infected, the test is not at all sensitive, so nobody is able to pick up the asymptomatic people very easily⁹

Rapid point of care testing

At least two fast, point-of-care tests have been developed, and are in use, in the UK.¹⁰ The SAMBA II machine, for example, is currently being used at Addenbrookes Hospital in Cambridge and will shortly be rolled out more widely. It looks for “tiny traces of genetic material belonging to the virus, amplifies it billions of times chemically and is therefore extremely sensitive in the detection of active infections”.¹¹ It is able to provide a diagnosis in less than 90 minutes and relies on the patient providing a nasal and throat swab. Ongoing research at Cambridge is

⁶ G Iacobucci, Covid-19: What is the UK's testing strategy? [BMJ](#) 2020; 368; N Subbaraman, Coronavirus tests: researchers chase new diagnostics to fight the pandemic, [Nature](#), 23 March 2020; NHS England and NHS Improvement, [Guidance and standard operating procedure, COVID-19 virus testing in NHS laboratories](#), 16 March 2020

⁷ [PO 30199](#) [on Coronavirus: Screening] 24 March 2020

⁸ Q54 - Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 5 March 2020,

⁹ Q78 - Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 17 March 2020

¹⁰ Department of Health and Social Care, [Coronavirus \(COVID-19\) Scaling up our testing programmes](#), 4 April 2020, para 1.19

¹¹ [Rapid COVID-19 diagnostic test developed by Cambridge team to be deployed in hospitals](#), University of Cambridge Communications, 2 April 2020

also examining whether the SAMBA II machine could identify asymptomatic individuals.¹²

1.2 Tests in development

Serological tests

A serological test uses a blood or plasma sample to detect if the patient has antibodies to the virus (namely proteins that are produced by white blood cells that bind to the virus and destroy/disable it).¹³ This type of test could tell whether the individual has previously had the virus, even if they had not shown symptoms. As the GCSA explained, “with an antibody test, we would have a much better handle on the proportion of people who are asymptomatic and the true number who have had it in the community already”.¹⁴

Multiple companies are currently developing antibody tests for Covid-19. Overviews can be found here:

- Tony Blair Institute for Global Change, [Covid-19 Testing in the UK: A Primer](#), 30 March 2020
- [What coronavirus tests does the world need to track the pandemic?](#) *Financial Times*, 1 April 2020

It has been suggested that this information could be used to help determine whether individuals could return to normal social interaction without risking picking up, or passing on, the virus. Professor Yvonne Doyle, Medical Director at Public Health England, described antibody tests as “the game changer” on the grounds that they will:

tell us who [...] is highly unlikely to transmit infection, which is important because it allows people to get back to some form of normality, including work.¹⁵

The Government has also raised the idea of issuing ‘[immunity certificates](#)’ to those who have had and recovered from the virus.¹⁶

There are, however, challenges associated with using serological tests as a means to ‘screen’ a population. These are linked both to the accuracy of the test – namely its sensitivity (ability to identify positive cases correctly) and its specificity (ability to identify negative cases correctly) – but also the prevalence of the disease throughout the population. An overview can be found in the following article:

- [Why it’s too early to start giving out “immunity passports”](#), *MIT Technology Review*, 9 April 2020

¹² [Rapid COVID-19 diagnostic test developed by Cambridge team to be deployed in hospitals](#), University of Cambridge Communications, 2 April 2020

¹³ N Subbaraman, Coronavirus tests: researchers chase new diagnostics to fight the pandemic, *Nature*, 23 March 2020

¹⁴ Q78 - Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 17 March 2020

¹⁵ Q234 - Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 26 March 2020

¹⁶ [No 10 seeks to end coronavirus lockdown with 'immunity passports'](#), *The Guardian*, 2 April 2020

Box 1: Is it possible to have Covid-19 disease more than once?

Immunity to the SARS-CoV-2 virus is not yet well understood; at present, it is not clear if patients who recover from Covid-19 are immune to the disease and, if so, for how long. Peter Openshaw, Professor of Experimental Medicine at Imperial College London, told the *New Scientist* that because the virus is so new:

we do not yet know how long any protection generated through infection will last. We urgently need more research looking at the immune responses of people who have recovered from infection to be sure.¹⁷

The overall health of the individual may also have a role to play. Vineet Menachery, a virologist at the University of Texas Medical Branch, told *Time* magazine that the degree of immunity could also differ from person to person:

depending on the strength of the patient's antibody response. Younger, healthier people will likely generate a more robust antibody response, giving them more protection against the virus in future.¹⁸

The World Health Organization has also emphasised that there is currently a lack of evidence regarding immunity to Covid-19. Speaking on 17 April, Dr Maria van Kerkhove, head of the WHO's emerging diseases and zoonosis unit, said:

Right now, we have no evidence that the use of a serological test can show that an individual has immunity or is protected from reinfection [...] These antibody tests will be able to measure that level of seroprevalence - that level of antibodies but that does not mean that somebody with antibodies means that they are immune.¹⁹

On the 24 March 2020, the Health Secretary, Matt Hancock, [announced](#) that the Government had purchased 3.5 million antibody tests.²⁰ Nine days later, [The Guardian](#) reported that the Government had "bought options on up to 17.5m antibody tests of different types [for use at home] that are currently being tested".²¹

Exactly when these tests will be ready for use, and distributed, is currently unclear. Professor Doyle, Medical Director at PHE, described the test on 26 March as "well advanced but not yet ready", adding that "we need to be absolutely sure that it is a valid test. We expect that to come within a couple of weeks, but I would not want to over-promise on that".²² Speaking on the 2 April, the Health Secretary, Matt Hancock, said the results of many of the early tests had been "poor", though he was reported to be more hopeful about later ones that have been acquired.²³

On 6 April, the Government stated that none of the 'at home' antibody testing kits have so far "been proved to be good enough to be used".²⁴

¹⁷ [Can you catch the coronavirus twice? We don't know yet](#), *New Scientist*, 25 March 2020

¹⁸ [Can You Be Re-Infected After Recovering From Coronavirus? Here's What We Know About COVID-19 Immunity](#), *Time Magazine*, 3 April 2020

¹⁹ [Coronavirus: Double warning over antibody tests](#), *BBC News Online*, 18 April 2020

²⁰ [Matt Hancock: 3.5m coronavirus test kits on way to NHS](#), *The Guardian*, 24 March 2020

²¹ [No 10 seeks to end coronavirus lockdown with 'immunity passports'](#), *The Guardian*, 2 April 2020

²² Q197- Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 26 March 2020

²³ [No 10 seeks to end coronavirus lockdown with 'immunity passports'](#), *The Guardian*, 2 April 2020

²⁴ [UK government admits Covid-19 antibody tests don't work](#), *Financial Times*, 6 April 2020

Sir John Bell, Regius Professor of Medicine at the University of Oxford – where a team is evaluating the tests – said:

Sadly, the tests we have looked at to date have not performed well. We see many false negatives (tests where no antibody is detected despite the fact we know it is there) and we also see false positives. None of the tests we have validated would meet the criteria for a good test as agreed with the MHRA [*Medicines and Healthcare products Regulatory Agency*]. This is not a good result for test suppliers or for us.²⁵

Kathy Hall, Director of Covid-19 testing strategy at the Department of Health and Social Care (DHSC), stated on the 8 April that the DHSC was now working “with companies to cancel the orders [for the antibody tests] and get our money back where possible”.²⁶

While ‘at home’ antibody test kits have not performed well, *The Times* reported that antibody tests processed in laboratories, using “a standard laboratory diagnostic tool”, have proved to be accurate and that they are currently being used in a research programme to improve our understanding of the spread of the virus.²⁷ The President of the Royal College of Pathologists, Professor Jo Martin, has been asked to work with NHS laboratories to see whether similar tests — known as enzyme-linked immunosorbent assays (Elisa) — could be used to increase testing capacity in local hospitals.²⁸

²⁵ J Bell, [Trouble in testing land](#), University of Oxford Research 5 April 2020

²⁶ Q167 - Commons Science and Technology Committee, [Oral evidence, UK Science, Research and Technology Capability and Influence in Global Disease Outbreaks](#), HC 136, 8 April 2020

²⁷ [NHS labs will help boost virus antibody tests to 90,000 a day](#), *The Times*, 9 April 2020

²⁸ [NHS labs will help boost virus antibody tests to 90,000 a day](#), *The Times*, 9 April 2020

2. Testing capacity

Testing capacity refers to the number of tests that can be run, and results processed, at any one time. Until recently, a centralised approach was pursued, with Covid-19 testing undertaken by Public Health England (PHE), initially in its Colindale facility and subsequently in its regional laboratories. The Deputy CMO told the Health and Social Care Select Committee on 5 March 2020 that PHE's "eight sites [could] do 2,000 tests a day".²⁹

A more distributed approach to testing has subsequently been developed to increase capacity. On 11 March 2020, [NHS England](#) announced that it was working with PHE to increase the number of samples that could be analysed to 10,000 a day:

the NHS is now scaling up tests by 500%, with NHS England asking expert NHS laboratory services across the country to bring new capacity online, and other labs to begin checks, enabling 8,000 more samples to be analysed every day of the week [...] The additional resource to process more tests will mean local hospital labs will join specialist services, including those already provided by PHE, in being able to accurately detect the presence of the new virus, with learning and technology shared across NHS services nationwide.³⁰

[BBC News Online](#) reported that by mid-March, 40 NHS labs across the UK were running Covid-19 tests.

On 17 March, the Prime Minister [stated](#) that capacity would increase to 25,000 a day in two weeks. Following continued criticism that insufficient tests were being conducted, especially on NHS staff,³¹ the Health Secretary [announced](#) that the NHS would carry out 100,000 tests a day by the end of April 2020 through relying on a network including private industry, academia, and the NHS (see Section 3.1 for further detail).³²

By the beginning of April, several '[local](#)' initiatives had led to the Francis Crick Institute in London, Cancer Research UK units in Glasgow, Manchester and Cambridge, and laboratories at leading universities, being transformed into diagnostic facilities for Covid-19.³³

By the 4 April 2020, [testing capacity](#) for inpatient care in England stood at 12,799, though not all that capacity was being used; a total of 11,085 tests were carried out for 8,651 people on 4 April (the Department of Health and Social Care notes that some people may require multiple tests, following an inconclusive first result or to check a

²⁹ Q54 - Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 5 March 2020,

³⁰ [News: NHS to ramp up coronavirus testing labs](#), NHS England, 11 March 2020

³¹ [Coronavirus: just 2,000 NHS frontline workers tested so far](#), *The Guardian*, 1 April 2020

³² [News story: Testing for coronavirus \(COVID-19\) will increase to 25,000 a day](#), Department of Health and Social Care, 18 March 2020; [Press release: Health Secretary sets out plan to carry out 100,000 coronavirus tests a day](#) Department of Health and Social Care, 2 April 2020

³³ [Small laboratories join coronavirus testing effort after 'precious time wasted'](#), *The Guardian*, 2 April 2020

negative test).³⁴ As of 9am on 19 April 2020, 21,626 tests had been carried out the previous day across the UK for 15,944 people.³⁵ Testing capacity was not reported alongside these figures. However, on 16 April, a spokesperson for the Prime Minister stated that NHS, Public Health England and devolved administration labs were now able “to conduct 20,771 antigen tests a day, while a further 14,300 can be carried out by commercial contractors in 26 drive-through facilities across Britain”.³⁶

Box 2: Testing capacity in other countries

Germany has been identified in the [media](#) as a European country that has 'led the way' with large-scale testing of the population.³⁷ Data from the [Robert Koch Institute](#) in Germany (which is coordinating its public health response to the pandemic) shows that between 22 and 28 March 2020, a total of 354,521 tests were performed by 143 laboratories.³⁸

It has also been suggested that certain Asian countries - such as South Korea which, as of 6 April 2020 had [conducted](#) over 466,000 tests for Covid-19 since the outbreak began - have applied their experience of both Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) to address Covid-19 effectively.³⁹

The Department for Health and Social Care has subsequently acknowledged that both Germany and South Korea have “higher testing rates than the UK”, and that “Germany has been able to take advantage of the existing technology and infrastructure in its large diagnostics industry, with over 100 cutting edge testing labs”.⁴⁰

At the daily Covid-19 press briefing on 7 April 2020, the Chief Medical Officer, Professor Chris Whitty, highlighted Germany's approach to testing, stating “we all know that Germany got ahead in terms of its ability to do testing for the virus and there's a lot to learn from that and we've been trying to learn the lessons from that.”⁴¹

2.1 Why is testing capacity in the UK not higher?

Several reasons have been put forward to explain why the UK's testing capacity is not higher. They include:

Under-preparation

The Government has been criticised for failing to prepare sufficiently for the pandemic and for not increasing manufacturing or imports of testing kits earlier. An article in [Buzzfeed](#), for example, notes that

³⁴ Twitter: Department of Health and Social Care, [Testing update for 4 April](#), posted 5 April 2020

³⁵ Department of Health and Social Care and Public Health England, [Guidance: Number of coronavirus \(COVID-19\) cases and risk in the UK, 18 April](#), published on 19 April 2020

³⁶ [Coronavirus: Government boosts testing capacity to 35,000 a day but says 'not enough demand'](#), *The Independent*, 16 April 2020; [Coronavirus testing to be rolled out to more public service staff](#), *BBC News Online*, 17 April 2020

³⁷ [Germany conducting more than 50,000 coronavirus tests a day](#), *Financial Times*, 2 April 2020

³⁸ [Coronavirus Disease 2019 \(COVID-19\) Daily Situation Report of the Robert Koch Institute](#), 2 April 2020

³⁹ [What Prepares a Country for a Pandemic? An Epidemic Helps](#), *Bloomberg Opinion*, 18 March 2020

⁴⁰ Department of Health and Social Care, [Coronavirus \(COVID-19\) Scaling up our testing programmes](#), 4 April 2020

⁴¹ [UK looks to learn from German mass tests in quest to end lockdown](#), *Financial Times*, 7 April 2020

imports of testing kits are “now extremely difficult as other nations seek more than ever to keep them for their own use”, while the [The Guardian](#) reports “critics” as saying that “a better pandemic preparedness plan might have foreseen the surge in demand for testing materials and arranged to act swiftly”.⁴² Richard Horton, editor of the medical journal *The Lancet*, wrote that the severity of the situation in China in January 2020 should have prompted preparedness plans to be readied:

February should have been used to expand coronavirus testing capacity, ensure the distribution of WHO-approved PPE, and establish training programmes and guidelines to protect NHS staff. They didn't take any of those actions. The result has been chaos and panic across the NHS. Patients will die unnecessarily. NHS staff will die unnecessarily. It is, indeed, as one health worker wrote last week, “a national scandal”.⁴³

In response to Dr Horton's editorial, a spokesperson from the Department of Health and Social Care stated on 28 March that the Government had “acted swiftly to contain the spread of the virus and [its] world-class surveillance, including intensive contact tracing and quarantining of early cases, helped to slow it significantly – and targeted contract-tracing continues”.⁴⁴

Others, however, have pointed to constraints in the country's existing testing system that have made it difficult to scale up testing capacity, as well as supply chain problems and shortages of key materials, as discussed below.

Scaling up testing capacity

Professor Neil Ferguson, Director of the MRC Centre for Global Infectious Disease Analysis at Imperial College London, has been modelling the likely impact of public health measures on slowing and suppressing the spread of coronavirus. He is also a member of the Covid-19 [Scientific Advisory Group for Emergencies](#) (SAGE) which provides scientific and technical advice to support government decision making during emergencies.⁴⁵ Professor Ferguson told the Commons Science and Technology Committee on 25 March that increasing testing capacity “was not included in [his] initial modelling”. This, he explained, was because:

the projections by PHE of how quickly this country could ramp up testing capacity [...] If we are talking about back in January/February/early March, it was very clear from messages from Public Health England that we would have nowhere near

⁴² [Even The US Is Doing More Coronavirus Tests Than The UK. Here Are The Reasons Why](#), *Buzzfeed*, 31 March 2020; [UK coronavirus testing: what ministers said and what has happened](#), *The Guardian*, 1 April 2020

⁴³ R Horton, [Offline: COVID-19 and the NHS—“a national scandal”](#), *The Lancet*, vol 395(10229), p1022, 28 March 2020

⁴⁴ [‘Chaos and panic’: Lancet editor says NHS was left unprepared for Covid-19](#), *The Guardian*, 28 March 2020

⁴⁵ Q4 – Commons Science and Technology Committee ,Oral evidence: [UK science, research and technology capability and influence in global disease outbreaks](#), HC 136, 25 March 2020

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enough testing capacity to adopt that strategy [of widespread testing and contact tracing].⁴⁶

Laboratory space

Earlier in the pandemic, questions were raised about whether the UK had sufficient, suitable laboratory space for Covid-19 testing. [David Farren](#), a consultant in medical microbiology and an infection control doctor in Northern Ireland, and [Paul Hunter](#), a professor in medicine at the University of East Anglia, both noted that in the early to mid 2000s, laboratories were closed or consolidated following a [review of laboratory capacity in 2006](#):

Many of the laboratories in the old network were shut down, taken over by local hospitals or merged into a smaller number of regional laboratories. So even if it did have enough kits, the UK would no longer have the capacity, equipment or biomedical scientists to match the testing capacity of its European neighbours.⁴⁷

Giving evidence to the Commons [Science and Technology Select Committee](#), Professor Sharon Peacock, Interim Director of the National Infection Service at PHE, confirmed that “laboratories [...] have largely been merged”, leading to “a smaller number of larger laboratories”. Professor Peacock, however, did not see this as problematic:

the alternative is to have a single large testing site. From my perspective, it is more efficient to have a bigger testing site than dissipating our efforts into a lot of laboratories around the country.⁴⁸

Professor John Newton, the Government’s advisor on increasing Covid-19 testing capacity, later told the same Committee that, at least initially, only particular types of laboratories were designated as suitable for handling the disease:

What is often not appreciated is that, to begin with, testing for coronavirus was designated as something that could be carried out only in a category 3 safe laboratory because of the infectious nature of the disease. There are not that many category 3 laboratories outside Public Health England and a relatively small number of universities, and they actually have quite small capacity. It was only at the beginning of March that the relevant authorities—that was not Public Health England, by the way—recategorised the virus down to category 2, and that of course opened up the possibility of a whole lot more laboratories undertaking testing. In fact, that change occurred at the request of Public Health England.⁴⁹

⁴⁶ Q20 – Commons Science and Technology Committee ,Oral evidence: [UK science, research and technology capability and influence in global disease outbreaks](#), HC 136, 25 March 2020

⁴⁷ [Why the UK failed to get coronavirus testing up to speed](#), *The Guardian*, 1 April 2020

⁴⁸ Q122- Commons Science and Technology Committee ,Oral evidence: [UK science, research and technology capability and influence in global disease outbreaks](#), HC 136, 25 March 2020

⁴⁹ Q172 - Commons Science and Technology Committee ,Oral evidence: [UK science, research and technology capability and influence in global disease outbreaks](#), HC 136, 8 April 2020

Availability of key materials: reagent and testing kit shortages

There are ongoing reports that some of the chemicals, or reagents, required for Covid-19 testing are in short supply (see Box 3). On 3 April 2020, the [Institute of Biomedical Science](#) (IBMS) issued a press release on testing capacity. It stated that it was the poor availability of key materials that was holding back testing in the UK, and not lack of facilities or trained staff:

laboratory staff in the NHS are running a 24-hour service that is using all the materials that they have at their disposal but their skills are underutilised due to supply problems. There is a huge gap between testing equipment capacity and material availability.⁵⁰

[Stephen Baker](#), Professor of Molecular Microbiology in the Department of Medicine at the University of Cambridge, said: “There is a massive demand for raw materials and commercial kits, this is not unique to the UK, and many places no longer have stock of essential reagents”.⁵¹

Box 3: Why are reagents needed in the RT-PCR test?

Robin May, Professor of Infectious Disease and Director of the Institute of Microbiology and Infection, University of Birmingham, explains how the RT-PCR test works and why reagents are needed:

SARS-COV-2 is an RNA virus, which means that its genome is based not on DNA, but on RNA (a closely-related molecule). Detecting the virus relies on specifically detecting a ‘sequence’ of RNA that is unique to this virus, converting it into DNA and then amplifying that DNA (essentially, making copies of it) via a process called PCR (polymerase chain reaction). The conversion of RNA to DNA requires one enzyme (reverse transcriptase) and then amplifying the DNA requires another (polymerase).

Both of these enzymes are biological molecules that have to be produced (typically in bacteria), then purified, usually only in small scale. Normally, demand for these enzymes is very steady and relatively low, so scaling up to the massive quantities that are required for COVID19 testing takes time. In addition, it is critical to ensure ‘quality control’ of the extraordinarily large number of kits that must be produced, to minimise the risk of false positive/negatives. Tackling all of these rate-limiting steps together to eliminate all of the bottlenecks is the primary reason why testing has been relatively slow to roll-out so far.⁵²

Allan Wilson, President of the IBMS, told *The Guardian* that there were shortages of both the test kits as well as:

some very basic reagents, such as the virology transport medium that we need to put the swabs in. The actual swabs are in short supply – effectively they are rationed in my patch in Scotland but I know there are problems in England as well.” The lysis buffer, used in extracting the RNA of the virus, was “in very, very short supply”, he said. So are precision plastics – “the little tubes and

⁵⁰ Institute of Biomedical Science, [We are ready to test – give us what we need](#), 3 April 2020

⁵¹ Science Media Centre, [Expert comments about reagents needed for COVID-19 swab PCR testing](#), 1 April 2020

⁵² Science Media Centre, [Expert comments about reagents needed for COVID-19 swab PCR testing](#), 1 April 2020

pipettes, so each test gets its own individual tube". Those will not be available until mid-May.⁵³

The reagents also have to be compatible with the machines that they will be used in. [According to Professor Doyle](#), medical director at PHE "the reagents are generally produced by the manufacturers of the machines and so the reagents that work best are those that work with the machines that they're intended for, that's the most efficient".⁵⁴

The UK trade body the Chemical Industry Association, however, has questioned what exactly is in short supply:

While there is of course an escalating demand, there are reagents being manufactured and delivered to the NHS. Every business here in the UK and globally is looking at what they can do to help meet the demand as a matter of urgency. To clarify the exact NHS need and meet it, all relevant UK industries are continuing to work closely with Government [...] We are here to help if Government tells us what is needed.⁵⁵

Logistical challenges

Even if supplies of vital reagents are secured from overseas, there have been reports that distribution –physically getting the supplies into the UK – is challenging due to the large number of aircraft that are currently grounded. Professor Charlie Swanton, Chief Clinician at Cancer Research UK, told *The Guardian* that "to make matters worse, because all the airlines have grounded their planes, there is no cargo space" to have testing kits and reagents delivered.⁵⁶

⁵³ [UK ministers struggle to keep promise of 100k coronavirus tests by end of April](#), *The Guardian*, 3 April 2020

⁵⁴ [Coronavirus testing plans in chaos](#), *The Times*, 2 April 2020

⁵⁵ Chemical Industries Association, [Covid-19: Chemical Businesses](#), not dated

⁵⁶ [UK ministers struggle to keep promise of 100k coronavirus tests by end of April](#), *The Guardian*, 3 April 2020

3. Criteria for being tested

At the start of the outbreak, until 12 March, the UK pursued a testing policy which aimed to “contain” the virus and “disrupt transmission”.⁵⁷ The [Government's Coronavirus Action Plan](#) explained that, to contain the virus, it would seek to “detect early cases, follow up close contacts, and prevent the disease taking hold in this country for as long as is reasonably possible”.⁵⁸ Professor Doyle told the Health and Social Care Committee that, during this period, PHE contacted “almost 4,000 people [...] from about 590 positive tests” but that they subsequently started to see community transmission:

At a point before we stopped that intensive contact tracing, it became clear to us that there were what I call dead ends of contacts where you had a case, you tried to find the contact, and it just was not possible, because that gave us the indication that there was sustained community transmission. Nevertheless [...] we kept going until mid-March, until we were absolutely sure that contact tracing in that way would not work.⁵⁹

As the UK [moved](#) from the ‘contain’ to ‘delay’ phase of its response to the virus on the 12 March, the criteria for testing narrowed to only the most severe cases.⁶⁰ A response to a [PQ](#) on the matter stated that the Chief Medical Officer had advised that it was necessary “to prioritise testing to those who have the greatest clinical need” with tests primarily given to:

1. all patients in critical care for pneumonia, acute respiratory distress syndrome (ARDS) or flu like illness;
2. all other patients requiring admission to hospital for pneumonia, ARDS or flu like illness; and
3. where an outbreak has occurred in a residential or care setting, for example long-term care facility prisons.⁶¹

The Government Chief Scientific Adviser, Sir Patrick Vallance, indicated that the revised testing criteria reflected the UK's limited testing capacity:

We need to use the testing in the right place at the moment. We simply do not have mass testing available for the population now. There is a big effort going on to try to get it in place as quickly as possible to be able to manage this.⁶²

3.1 Testing NHS staff

On the 27 March, the Government announced that testing would be extended to frontline NHS staff in England. The Minister for the Cabinet

⁵⁷ Q198 - Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 26 March 2020

⁵⁸ Department of Health and Social Care, [Policy paper: Coronavirus action plan: a guide to what you can expect across the UK](#), 3 March 2020

⁵⁹ Q198 - Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 26 March 2020

⁶⁰ [Speech: PM statement on coronavirus](#), gov.uk, 12 March 2020

⁶¹ [PQ 30157](#) [on Coronavirus: Screening], 24 March 2020

⁶² Q83 -Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 17 March 2020

Office, Michael Gove, [stated](#) that “hundreds” of tests would “take place by the end of the weekend - dramatically scaling up next week”, [beginning](#) with critical care doctors and nurses and other intensive care staff, as well as those in emergency departments, ambulance services and GPs.⁶³ The [Government](#) confirmed that those who test negative for Covid-19 “will be able to return to work - enhancing the capacity of the NHS and social care to treat patients and care for those in community settings”.⁶⁴

The Department of Health and Social Care explained that the expansion in testing would be delivered through a new partnership between “Thermo Fisher Scientific, Amazon, Boots, Royal Mail and Randox, alongside the Wellcome Trust” and universities, to create a network of new labs and testing sites across the UK.⁶⁵ These include three new ‘hub laboratories’ – which will be set up for the duration of the crisis – together with “over 50 regional test centres around the country by the end of April”.⁶⁶ In addition, Randox has developed and produced sample self-collection kits, to be “distributed through Amazon, to enable testing of critical key workers throughout the UK whilst they remain at home”.⁶⁷

The British Medical Association (BMA) and others had repeatedly called for NHS staff to be tested. The Chair of the BMA, Dr Chaand Nagpaul, told the Health and Social Care Committee that when the announcement was first made to stop testing and contact tracing and to self-isolate instead, he had raised the issue of the impact it would have on the NHS workforce:

Literally the day after, we saw large numbers of NHS staff not coming into work [...] The staff themselves who were self-isolating were telling us that many of them felt able to work but were following the guidance. If they were able to be tested, they would come back to work. We made that point right at the outset, and it seems counter-intuitive that we are reducing our NHS workforce at a time when we need them the most.⁶⁸

On 8 April 2020, Professor John Newton, the Government’s advisor on increasing Covid-19 testing capacity, stated that a total of 20,000 NHS staff had now been tested for Covid-19.⁶⁹ The National Medical Director at NHS England, Professor Stephen Powis, clarified the testing

⁶³ [Coronavirus: Health workers on frontline to be tested in England](#), *BBC News Online*, 27 March 2020; [Frontline NHS staff first to receive new Covid-19 antigen tests](#), *The Guardian*, 27 March 2020

⁶⁴ [Press release: Government launches new drive on coronavirus tests for frontline NHS staff](#), Department of Health and Social Care, 27 March 2020

⁶⁵ Press release: [Government launches new drive on coronavirus tests for frontline NHS staff](#), Department of Health and Social Care, 27 March 2020

⁶⁶ Department of Health and Social Care, [Coronavirus \(COVID-19\) Scaling up our testing programmes](#), 4 April 2020, para 1.17

⁶⁷ Department of Health and Social Care, [Coronavirus \(COVID-19\) Scaling up our testing programmes](#), 4 April 2020, para 1.18

⁶⁸ Q203 - Health and Social Care Committee, [Oral evidence: Preparations for the Coronavirus](#), HC 36, 26 March 2020

⁶⁹ Q142 - Commons Science and Technology Committee, [Oral evidence: UK Science, Research and Technology Capability and Influence in Global Disease Outbreaks](#), HC 136, 8 April 2020

criteria for NHS staff when giving evidence to the Commons Science and Technology Committee. He told Members that the scientific evidence did not support testing all NHS workers and that, instead, testing was focused on:

those workers who are absent from work, either because a member of their family is unwell and has symptoms, and therefore they are in 14 days of home quarantine as per Government instructions, or they are symptomatic themselves and are therefore self-isolating for seven days [...] it is then the member of the household who is symptomatic who is tested; it is not the NHS staff member, because they are clearly in quarantine because somebody else is symptomatic.⁷⁰

[Guidance](#) on 'coronavirus testing for critical workers who are self-isolating' was published on 15 April.⁷¹

3.2 100,000 tests

Five days after the announcement that testing was being extended to NHS staff, the Government faced renewed [criticism](#) after it became apparent that by 1 April, 2,000 NHS frontline workers had so far been tested, out of approximately 500,000.⁷² The following day, the Health Secretary, Matt Hancock, [pledged](#) that England would "carry out 100,000 tests for coronavirus every day by the end of this month" and set out a new 5-pillar plan to help realise that goal:

- Scale up swab testing in PHE labs and NHS hospitals for those with a medical need and the most critical workers to 25,000 a day in England by mid to late April, with the aligned testing strategies of the NHS in the Devolved Administrations benefiting from PHE's partnership with Roche through a central UK allocation mechanism;
- Deliver increased commercial swab testing for critical key workers in the NHS across the UK, before then expanding to key workers in other sectors;
- Develop blood testing to help know if people across the UK have the right antibodies and so have high levels of immunity to coronavirus;
- Conduct UK-wide surveillance testing to learn more about the spread of the disease and help develop new tests and treatments; and
- Create a new National Effort for testing, to build a mass-testing capacity for the UK at a completely new scale.⁷³

See: Department of Health and Social Care, [Coronavirus \(COVID-19\) Scaling up our testing programmes](#), 4 April 2020

⁷⁰ Q146 - Commons Science and Technology Committee, [Oral evidence, UK Science, Research and Technology Capability and Influence in Global Disease Outbreaks](#), HC 136, 8 April 2020

⁷¹ Department of Health and Social Care, [Guidance on coronavirus testing for critical workers who are self-isolating](#), 15 April 2020

⁷² [Coronavirus: just 2,000 NHS frontline workers tested so far](#), *The Guardian*, 1 April 2020

⁷³ Press release: [Health Secretary sets out plan to carry out 100,000 coronavirus tests a day](#), Department of Health and Social Care, 2 April 2020

Antibody tests will be included in the 100,000 target if they are shown to work, though the DHSC expects that the target can be met “purely with the antigen test”.⁷⁴

The pledge was met with scepticism by some. Allan Wilson, President of the IBMS, told *The Times* that NHS labs did not have enough test kits, were struggling to source both kits and reagents and that he would, therefore, be “surprised” if the 100,000 target was met by the end of April.⁷⁵ Testing manufacturers were also reported to be “blindsided” by the announcement.⁷⁶ Doris-Ann Williams, chief executive of the British In Vitro Diagnostics Association (BIVDA), said:

The target is his target that he set without any consultation with industry [...] So while we'll do everything we can to help meet it because it's in our interest as part of the UK population, we can't make any promises.⁷⁷

A pilot of an ‘at home’ testing service, relying on logistics provided by Amazon, was reported by *The Times* to be beginning the week commencing 20 April, as part of the Government's efforts to reach the 100,000 target. The approach is said to rely on swabs being sent to people's homes. The individual uses the swab to take a sample from their throat, before it is collected. The scheme is separate from attempts to provide an ‘at home’ antibody test kit.⁷⁸

3.3 Care homes

At the Government's daily Covid-19 press briefing on 13 April, the Chief Medical Officer, Professor Chris Whitty, announced that 92 care homes in England – 13.5% – had reported at least one case of Covid-19 in the last 24 hours.⁷⁹ The Department of Health and Social Care later confirmed that 2,099 care homes in England have had cases of the virus during the course of the pandemic.⁸⁰ Data published by the Office for National Statistics (ONS) for England and Wales show that, since the start of 2020, 217 deaths involving Covid-19 have occurred in care homes, with an additional 33 deaths in hospices, compared to 3,716 deaths occurring in hospitals.⁸¹ The ONS figures cover the period up to 3 April 2020; its website explains that the numbers produced by the ONS “take longer to prepare [*than those published by the DHSC*]”

⁷⁴ [Matt Hancock pledges 100,000 coronavirus tests a day](#), *The Times*, 3 April 2020

⁷⁵ [We'll struggle to hit 100,000 coronavirus tests a day, say firms](#), *The Times*, 4 April 2020

⁷⁶ [We'll struggle to hit 100,000 coronavirus tests a day, say firms](#), *The Times*, 4 April 2020

⁷⁷ [Coronavirus latest: Matt Hancock 'didn't consult' with manufacturers on 100,000-a-day testing target](#), *iNews*, 4 April 2020

⁷⁸ [Home tests for Covid-19 delivered by Amazon](#), *The Times*, 17 April 2020

⁷⁹ [Coronavirus: 'Growing crisis' as 92 care homes report COVID-19 outbreaks](#), *Sky News* [online], 13 April 2020

⁸⁰ [Coronavirus: Older people being 'airbrushed' out of virus figures](#), *BBC News Online*, 14 April 2020

⁸¹ Office for National Statistics, [Deaths registered weekly in England and Wales, provisional: week ending 3 April 2020](#), published 14 April 2020

because they have to be certified by a doctor, registered and processed".⁸²

The Government [pledged](#) on 15 April that all staff working in social care settings who require a test will be able to access one and published [COVID-19: Our Action Plan for Adult Social Care](#). The Care Quality Commission will coordinate the tests and is aiming to have contacted all 30,000 care providers by the end of the week.⁸³ The DHSC reported that, to date, over 3,000 social care workers have been referred to local testing centres.⁸⁴ In addition, the Government stated that all patients discharged from hospital into a care home will be tested before they are moved. All care home residents with symptoms of the disease will also be tested; currently, testing is limited to the first five residents who are symptomatic.⁸⁵

While the pledge has been welcomed, concerns have been raised regarding the "logistical challenges" associated with testing residents and staff in care homes.⁸⁶ This is partly linked to the number of care homes in England. *BBC News Online* reported that while England has approximately 200 hospitals there are "more than 400,000 frail and vulnerable people [...] spread across more than 15,000 locations in England", potentially making it "difficult [...] to get out to homes to carry out the tests and [to] process them quickly enough".⁸⁷ The Association of Directors of Adult Social Services has also reportedly stated that testing care workers "appears to be being rolled out without being given thought to who is going to be tested and what we are going to do with the result".⁸⁸

⁸² Office for National Statistics, [Deaths registered weekly in England and Wales, provisional: week ending 27 March 2020](#), published 7 April 2020

⁸³ Press release: [Government to offer testing for "everyone who needs one" in social care settings](#), Department of Health and Social Care, 15 April 2020

⁸⁴ Department of Health and Social Care, [COVID-19: Our Action Plan for Adult Social Care](#), 15 April 2020, para 2.8

⁸⁵ Press release: [Government to offer testing for "everyone who needs one" in social care settings](#), Department of Health and Social Care, 15 April 2020

⁸⁶ [Coronavirus: More tests promised for care homes](#), *BBC News Online*, 15 April 2020

⁸⁷ [Coronavirus: More tests promised for care homes](#), *BBC News Online*, 15 April 2020

⁸⁸ [Coronavirus: Social care concerns revealed in leaked letter](#), *BBC News Online*, 16 April 2020

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