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# Scotland's Asymptomatic Testing Programme: an evaluation. November 2020-June 2021

HEALTH AND SOCIAL CARE

social research

# Asymptomatic Testing Programme Evaluation: November 2020 – June 2021

# Executive Summary

## Introduction

This evaluation examines the **asymptomatic** testing programme in Scotland. It covers the period November 2020 to June 2021. The majority of this programme relies on the use of Lateral Flow Device (LFD) testing, with some use of Polymerase Chain Reaction (PCR) testing in Community Testing and Prisons pathways. The quantitative data highlighted throughout this report therefore focuses strongly on the use of LFDs – where asymptomatic PCR use is discussed will be made clear.

Nine testing pathways that are some of the largest and/or a part of Scotland's critical infrastructure are evaluated: (i) targeted Community Testing; (ii) Early Learning and Childcare settings (ELC); (iii) Health and Social Care Workforce; (iv) Police Scotland and Scottish Fire and Rescue Service (SFRS) high risk staff groups testing; (v) Prison Staff testing; (vi) Schools testing (vii) University and College testing; and (viii) universal testing, with specific research on (ix) the highest risk individuals (previously termed 'shielding') and their households.

It is important to note that the data presented in this report relies on **reporting** of test results. The picture we have of the asymptomatic testing programme in Scotland relies on individuals reporting all of their results, whether positive, negative or void. There may be further uptake of testing, but individuals do not report results. This issue is reflected on throughout the report.

## The public health impact of testing

- In total, between 19 November 2020 and 27 June 2021, 6,650,650 test results were recorded. 14,728 of these were positive cases – 72% of these went on to take a confirmatory PCR and 81% of these were found positive.

- Between 23 November 2020 and 25 June 2021, the number of positive cases identified by LFD testing and confirmed by PCR is 7,271. These are cases that may not otherwise have been detected in the absence of symptoms, or were identified earlier than they otherwise would have been via PCR-based testing once symptomatic.

- Uptake of testing is difficult to measure as we know that not everyone records their test result. The data we do have show that there has been uptake of testing across the pathways and amongst the general population with the universal offer. This data also suggests that uptake and/or reporting may be declining over time, for example, with health care workers, school staff and pupils and other workplaces.

- Workplaces do seem to be a key site of engagement with asymptomatic testing, where the encouragement or requirement to test keeps people testing more regularly and recording results.

- Those testing outwith work settings are more likely to use testing sporadically than as intended (i.e. twice weekly testing).

## Attitudes and behaviours

- People are testing for a variety of reasons: for reassurance; to protect others; and for practical reasons.

- People may be less engaged or disengaged with testing because:
    - they do not see themselves as being at high risk from severe illness from Covid.
    - they have concerns about the test itself, such as discomfort or not being convinced of test accuracy
    - a range of practical reasons, such as problems recording results on the portal, lack of time, or confusion about pathways
    - and attitudes towards testing, such as not being clear on the benefits of regular testing or not agreeing with the testing programme.

- The data does not allow robust analysis of whether and when people 'switch' between pathways, but it is clear the number of pathways can cause confusion and people may not always be clear what pathway to record results under.

- When navigating the asymptomatic testing system, the pathway evaluations reported concerns with knowing what testing was available, carrying out tests, and recording test results. There were calls for more (and more accessible) information, reassurance about the accuracy and reliability of tests, and a more streamlined process for recording results.

- People are recording asymptomatic test results, but the data suggest people are more likely to record positive than negative results. More information on why recording negative (and void) results is important may be needed.

## Models and delivery

- There is no single model of delivery across the testing pathways, with several different models in place offering different advantages and challenges.

- Clear and streamlined communication tailored to different audiences (including information for children and young people, communication in different formats and via a range of media channels, and to take into account differences between Scotland and England) is key to making any model work.

- Delivery partners felt there could be improved communication between government and themselves, noting a lack of information in some settings and delays in information provision in others.

- Partnership working is key to the success of pathways, with some pathways highlighting the need for greater collaborative working and others noting close working being key to the successful implementation of their pathway.

- Delivery partners have also noted concerns with using the online portal and recording results and that the landscape of testing can cause confusion, potentially affecting uptake.

## Research and data

- The individual testing pathways have approached their evaluations in different ways, subject to data availability, time constraints, and reporting requirements to their own governance boards.

- To ensure a level of consistency across all pathways, minimum data requirements were agreed with the Scottish Government's Testing Programme Board, for each evaluation to report (as far as possible from available data).

- The extent and quality of data varies by pathway. Much of the data was set up for operational and not evaluation purposes.

- The data here presents the picture to mid/end June 2021, but the overall testing programme itself is complex and rapidly evolving so the situation will have changed since.

- The testing covered within this evaluation is asymptomatic testing and includes both LFD and PCR testing. It is now becoming clear that people may use LFD tests when they have symptoms, either instead of following the

guidance to book a PCR test or before doing so. We do not have a way as yet of disaggregating the data to identify where this is the case.

# Contents

# Introduction

Scotland's Testing Strategy[1] is a significant part of Scotland's approach to controlling the Covid-19 pandemic. It contributes to minimising virus transmission and supports Scotland in living with the virus in as safe a way as possible. The Testing Strategy sits within Scotland's wider strategic intent for approaching Covid-19. This intent is set out in Scotland's Strategic Framework[2] (the Framework current during the greater part of this evaluation) and includes the vaccination rollout, non-pharmaceutical interventions, border control measures, self-isolation, and wider supports for the harms caused by the pandemic.

The Testing Programme makes use of asymptomatic and symptomatic testing, using Lateral Flow Devices (LFD) or Polymerase Chain Reaction tests (PCR). LFD tests are intended to be used only for asymptomatic testing, while PCR tests can be used for both a- and symptomatic testing. Regular asymptomatic testing is intended to capture cases of the Covid-19 virus that would otherwise go undetected or be found much later in the virus progression, once symptoms had developed. Testing for and finding asymptomatic cases supports the aim of reducing transmission and saving lives.

The aim has been to encourage the use of this testing in critical frontline infrastructure, such as health and social care, prison and emergency services, and childcare and education settings. Alongside this, community testing has been developed to ensure communities most at risk of Covid-19 outbreaks and/or negative outcomes from Covid-19 have increased access to this testing. Over the time period of this evaluation, a universal offer of asymptomatic testing was rolled out for the wider population (beginning 26th April 2021).

The overall Testing Programme expanded considerably to take in asymptomatic testing, in a first expansion phase from November, a second phase from January/February, and significantly in April when testing was made available to everyone through the universal offer. Given this expansion and the development of a number of testing pathways to carry out asymptomatic testing, it is important to explore the relevant data and evidence to evaluate this programme of work.

[1] Coronavirus (COVID-19) - testing strategy: update - March 2021 - gov.scot (www.gov.scot)

[2] Coronavirus (COVID-19): Strategic Framework update - February 2021 - gov.scot (www.gov.scot)

Since March, the Scottish Government has carried out a rolling programme of data analysis and insight to consider the current state of the pandemic and provide insight into the contribution of the asymptomatic testing programme to the strategic intent outlined above. This has been presented weekly to the Testing Programme Board and includes research and evidence from colleagues across Health, Justice, and Education.

This report sets out the evidence and insights we have gathered across the major components of the overall expanded Testing Programme. The pathways examined in this evaluation are the largest testing pathways and/or those examining critical infrastructure: (i) targeted Community Testing; (ii) Early Learning and Childcare (ELC) settings testing; (iii) Health and Social Care Workforce testing; (iv) Police Scotland and Scottish Fire and Rescue Service (SFRS) high risk staff groups; (v) Prison Staff testing; (vi) Schools testing; (vii) Universal testing, with specific research on (viii) the highest risk individuals (previously known as 'shielding') and their households; and (ix) University and College testing.

We recognise that, though the asymptomatic testing pathways may have been set up to provide testing when a- or pre-symptomatic, not every individual will have used them in this way. There is some evidence within this report that people may have been using the tests as a way to 'check' their symptoms when in the early stages. This is an important finding from the evaluation, but we continue to refer to the pathways as 'asymptomatic testing pathways' as this was the intention when setting them up and the expectation of their use, particularly in workplace and critical function settings.

The time period of this evaluation covers the earlier stages of the asymptomatic testing programme – demand has much increased since, as the pathways have established themselves.

## Terminology

The Testing Programme: this refers to Scotland's overarching approach to testing, covering all individual testing pathways, and underpinned by Scotland's Testing Strategy.[3] The Testing Programme includes both symptomatic and asymptomatic testing, but this evaluation focuses on the asymptomatic elements of the programme.

Universal Offer: this refers to the universally accessible offer that gives any individual who does not have Covid-19 symptoms living in Scotland the opportunity to get free lateral flow test kits on a regular basis. The definition

[3] Coronavirus (COVID-19) - testing strategy: update - March 2021 - gov.scot (www.gov.scot)

'universal testing' has different meanings in the wider testing literature. For a discussion of those meanings, please refer to Annex B (p. 62).

Testing Pathways: within the overall Testing Programme there is a focus on specific, critical areas where testing has been deemed necessary. These areas are called 'pathways'. Initially asymptomatic testing focused on the critical areas of health and social care, schools, and community testing, before being widened out to capture a number of other critical areas, and finally a population wide offer of asymptomatic testing was developed.

Models of Delivery: this refers to the practical set-up and delivery of each testing pathway. Tests were made available in different ways in each pathway and this context is provided at chapter 4 to better understand the different models, their advantages, and challenges.

## Key evaluation questions

This evaluation aimed to answer a set of specific questions relating to the performance and public health impact of the asymptomatic testing programme in Scotland. These come under four headings: the public health impact of testing; attitudes and behaviours; models and delivery; and value for money. The first three areas are addressed in this report and are presented in the order set out below. Analysis of value for money and responses to more detailed modelling questions are being developed by economists in the Scottish Government for future reporting.

### The public health impact of asymptomatic (mainly LFD) testing

a) How many positive cases have been identified in total and through which pathways? What is the PCR conversion rate?

b) Has uptake of testing changed over time? Does this differ by pathway and demographic characteristics?

c) What is the profile of those tested and those that test positive in total and for each pathway? Is there is a particular pathway that has a better 'reach'?

### Attitudes and behaviours

- Why are people taking up the offer?

- Why are people not taking up the offer, or testing less frequently?

- Which channels are used and do people switch between channels?
- What were people's experiences of navigating the system?
- How do people behave following a positive test result? What does this behaviour vary by and why? What do we know about specific groups?
- How do people behave following a negative test result? What does this behaviour vary by and why? What do we know about specific groups?

### Models and delivery

- What have delivery partners learned about the rollout of testing across pathways and how has that changed over time?

### Additional evaluation questions to be addressed separately

- Is this a cost-effective intervention?
- Based on modelling, how many hospitalisations and deaths have been avoided?

## Sources of data used in the evaluation

All pathways were encouraged to create proportionate evaluation plans depending on requirements from their own Programme Boards (Governance Boards overseeing each pathway). The individual testing pathways have therefore approached their evaluations in different ways, subject also to data availability and time constraints. However, to ensure a level of consistency across all pathways, minimum data requirements were agreed with the overarching Testing Programme Board, for each evaluation to report as far as possible within available data. These are:

- Population size of group tested
- Uptake of testing and trends in uptake over time
- Cumulative total and weekly LFD tests completed
- % who booked PCR confirmatory test
- Results of confirmatory PCR test
- Feedback from workforce and partners

Pathways either used available data or worked to collect new data to respond to these requirements.

One key source of evidence across most pathways is Public Health Scotland's LFD dashboard[4] and weekly reporting.[5] The dashboard is made up of data collected from across the testing pathways on tests reported, positive tests, confirmatory PCR tests taken after a positive LFD test, percentage positivity rate, demographic data, and trends over time. Specific use has also been made of the Public Health Scotland Covid-19 Education Surveillance Report.[6] The data provided on these dashboards relies on test reporting by individuals – individuals provide their test results online or over the telephone. The data collected via these Scotland-specific and UK-level reporting portals is then collected together and analysed by Public Health Scotland (PHS) to provide a picture of the Scottish asymptomatic testing landscape.

Alongside this, analysts worked with other organisations and colleagues across Scotland to collect and make use of their data on uptake and created new programmes of research to deliver other quantitative and qualitative data to provide richer insights on experiences of the different pathways. This included surveys and focus groups. Insights were fed to respective Testing Programme Boards throughout the period of the evaluation to inform decision-making. Please see Annex A for an overview of each pathway. The surveys and focus groups undertaken by most pathways are not made up of representative samples. Those who take part in research are also likely to be more 'engaged populations', again representing a specific section of those taking part in testing. These data caveats are returned to again below and throughout the report so that the results of the evaluation can be better understood and contextualised.

One exception to this is the data used in the Universal Testing pathway. The Universal Testing pathway makes use of regular polling carried out by YouGov for Scottish Government. It is made up of a representative sample of the population made up of around 1000 adults 18+ across Scotland each week. Fieldwork is carried out mainly on the dates shown with the data used (Tuesday-Wednesday in any week), with a small number of interviews carried out on the Thursday morning to supplement this. This representative survey is a reliable and robust method of polling, and was used to better understand the views and behaviour of the Scottish population in relation to the Universal Testing offer. Insights from this polling have also been used to highlight wider thoughts and opinions on asymptomatic testing where relevant throughout.[7]

[4] COVID-19 Daily Dashboard | Tableau Public

[5] COVID-19 weekly report for Scotland - COVID-19 data and intelligence - COVID-19 - Our areas of work - Public Health Scotland

[6] PHS COVID-19 Education report (shinyapps.io)

[7] Public attitudes to coronavirus: tracker - data tables - gov.scot (www.gov.scot)

In discussing behaviours post-test and examining the process from testing to having to self-isolate, use is made of other Scottish Government work on self-isolation experiences.[8] As the largest piece of work on a Scotland-specific sample this was deemed the most useful to include in this evaluation. We recognise there is a wider literature on self-isolation and compliance, and have also published a literature review covering some of this wider evidence base.[9]

Finally, Annex B is an evidence review of evaluation work on testing pilots conducted in the UK, and international scholarly research, aiming to provide an account of models of delivery, benefits, barriers, costs and impacts of asymptomatic testing regimes, and to explore the lessons learned from these experiences. This evidence review will be referenced throughout this evaluation report to make relevant links between Scotland's data and the wider literature.

## Data quality and caveats

The quality of data varies by pathway. The majority of data that we use comes from Public Health Scotland via individual reporting mechanisms for each testing pathway. This data does not give a complete picture of the asymptomatic testing programme. Data is not available for everything that we might want to measure and we are often drawing assumptions from incomplete data or data that does not measure exactly what we are assessing. Much of the data is operational and was not created with the intention of using as part of an evaluation. Operational data is updated frequently, but not all pathways update on the same day. We have presented as much data as we have available and many pathways have undertaken empirical research to supplement this, as discussed above. That empirical research is of differing detail and robustness and it is important to stress that, where analysts have undertaken surveys and focus groups (excluding the Scottish Government/YouGov polling data), these samples are not representative of the general population or necessarily of the population within each pathway. Also, those who take part in research are often the most engaged populations and may not be representative of wider experiences and opinions.

It is also worth noting that, while the majority of the testing expansion programme relies on LFD testing, some pathways incorporate PCR tests,

[8] Coronavirus (COVID-19) support study experiences of and compliance with self-isolation: main report - gov.scot (www.gov.scot)

[9] Compliance with self-isolation and quarantine measures: literature review - gov.scot (www.gov.scot)

such as Prisons and Community Testing (see Annex A). The quantitative data highlighted throughout this report therefore focuses almost exclusively on the use of LFDs – where asymptomatic PCR use is discussed will be made clear.

Demographic data is limited across the datasets, so detailed information on *who* is testing, where, and when is not available. This means we do not have an adequate understanding of how testing is being used by different groups across Scotland or the reach of particular pathways, both in terms of protected characteristics and socio-economic status.

Finally, the programme itself is complex and rapidly evolving. This report considers data from the pathway evaluations November 2020 up to mid-June 2021, and the picture will have changed in the intervening time to publication. Though an evaluation of this scope is not intended to be replicated going forward, there will be ongoing monitoring of management and operational data to provide insight into the progress and performance of each pathway. This data will help to ensure this rapidly moving picture is fed back as required for decision-making.

# The Public Health Impact of Asymptomatic Testing

It is important to note from the outset that the data discussed in this chapter reflects **reporting** of results. There may be greater uptake of testing, but if individuals do not report their results this picture will not be reflected in the data. The data picture for testing is complex and will inevitably be incomplete, but we provide as robust a picture as possible in the data below.

## How many positive cases have been identified in total via LFD and through which pathways? What is the PCR conversion rate?

In total, between 19 November 2020 and 27 June 2021 there have been 14,728 positive LFD tests recorded.[10] People are requested to get a confirmatory PCR test if their LFD test is positive.

Over a similar but slightly different time period (23 November 2020 to 25 June 2021), 72% of positive LFD results were followed up with a PCR test and 81% of these were confirmed as positive. Therefore, the LFD testing programme identified 7,271 **confirmed cases** during the evaluation period. These are cases that may not otherwise have been detected in the absence of symptoms, or were identified earlier than they otherwise would have been via PCR-based testing once symptomatic.[11]

[10] Source: PHS weekly report

[11] Though we recognise some individuals may use LFD testing to 'check' early symptoms, we refer to the pathways as asymptomatic and finding asymptomatic cases throughout. This is how they would be used in workplace and critical function pathways, where regular testing occurs. For other pathways that are not connected to work though, even if being used as an early 'check' these cases may not have been found without the easy availability of LFD testing.

Table 1: Cumulative positive LFD tests and confirmatory PCR tests (23 Nov 2020 -25 June 2021)

| Positive LFDs Reported | % with confirmatory PCR | Total PCRs | % Positive PCR | Number Positive PCR |
|---|---|---|---|---|
| 12,595 | 72% | 9,028 | 81% | 7,271 |

(Source: Public Health Scotland)

Overall, the pathway that has identified the most cases in terms of numbers via LFD testing is 'Other', which mainly includes the Universal Testing offer. This is followed by Schools and Healthcare Worker pathways.[12] Table 2 provides these numbers and some more detail, but the table requires some further contextualisation. The different pathways presented on Table 2 have a range of different start dates and models of implementation; some of these pathways are self-test only, while some provide assisted testing. They are therefore not directly comparable and the presentation on one table is for ease of overview rather than direct comparison. The positivity rates for each pathway are also provided, but it should be noted that this rate depends on individuals recording test results, and in particular their negative results, which our evidence suggests may not be the case. Table 2 is taken from the PHS weekly report.[13]

[12] Source: PHS weekly report. In the PHS dashboard Health and Social Care workers are divided by relevant professional category, but within the Scottish Government the evaluation of Health and Social Care pathways was brought together.

[13] This table is an adapted version of the table included in the weekly Public Health Scotland COVID-19 Statistical Report published on 30 June 2021. The PHS Weekly report provides a range of information on testing data and trends: https://publichealthscotland.scot/media/8300/21-06-30-covid19-publication_report.pdf

Table 2: Number of LFD tests by Testing pathway 19 November 2020 – 27 June 2021

| Testing Pathway | Number of tests reported | Number of positive tests | % LFD positive |
|---|---|---|---|
| **School** | 1,925,138 | 2,378 | 0.1% |
| **Healthcare Worker** | 1,714,434 | 1,811 | 0.1% |
| **Other (including Universal offer)** | 994,671 | 8,127 | 0.8% |
| **Care Home Staff** | 888,502 | 563 | 0.1% |
| **Social Care** | 354,435 | 228 | 0.1% |
| **Unspecified** | 248,857 | 714 | 0.3% |
| **Care Home - Visitor** | 224,708 | 72 | 0.0% |
| **University Testing** | 95,497 | 371 | 0.4% |
| **Primary Care And Independent Contractors** | 91,304 | 37 | 0.0% |
| **Community Testing** | 55,397 | 378 | 0.7% |
| **Care Home - Visiting Professional** | 29,588 | 22 | 0.1% |
| **Emergency Control Room Staff** | 23,406 | 23 | 0.1% |
| **Food Processing** | 2,773 | * | * |
| **Quarantine Hotel Staff/Security Personnel** | 1,940 | * | * |
| **Total** | 6,650,650 | 14,728 | 0.2% |

It is also important to note the additional use of asymptomatic PCR testing, occurring in Community Testing, Healthcare Workers, and Prisons pathways. At the time of this evaluation concluding, 59% of community testing was asymptomatic. Of these asymptomatic tests, 64% was occurring via asymptomatic PCR testing in Mobile Testing Units (MTUs). 5,202 asymptomatic cases were identified out of 133,931 asymptomatic tests, giving a positivity rate of 3.9%.

In the Prisons pathway, the full rollout of testing to all eligible staff began in May 2021. The table below shows the weekly number of tests completed since full rollout, with a total of 2,510 carried out. Some additional tests were carried out prior to full rollout, meaning 3,660 PCR tests have been conducted in the Prisons pathway since March 2021 to the end of the evaluation period.

Table 3: Weekly total of PCR tests undertaken in the Prisons pathway since May 2021

| **Week Beginning** | 24-May | 31-May | 07-Jun | 14-Jun | 21-Jun | 28-Jun | **Cumulative total** |
|---|---|---|---|---|---|---|---|
| **No. of tests** | 436 | 443 | 429 | 399 | 350 | 453 | 2,510 |

(Source: NHS/Scottish Prison Service)

From the 2,510 PCR tests carried out since full rollout, 5 positive cases have been identified. This gives a positivity rate of 0.2%.

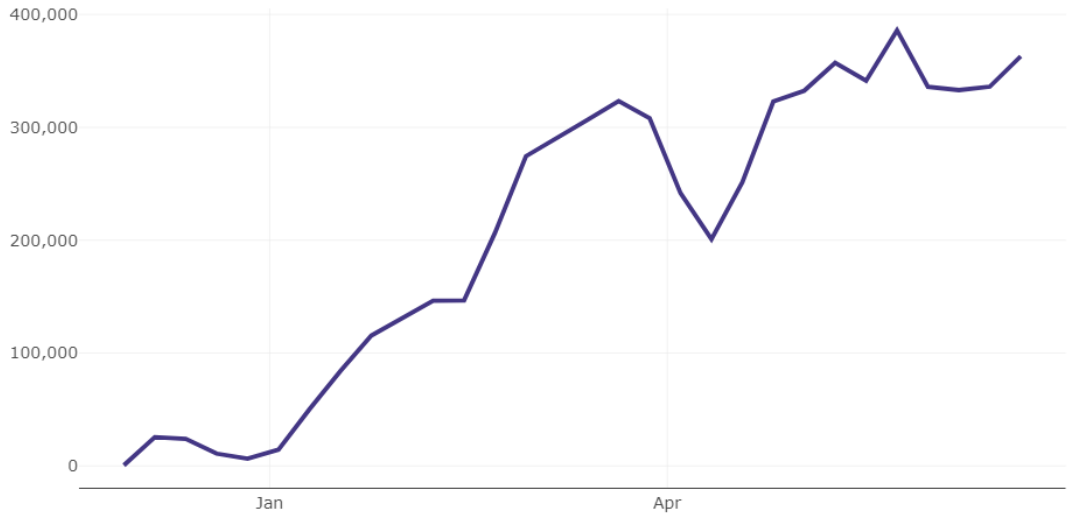
In the Healthcare Worker pathway, asymptomatic PCR testing has been available since July 2020 to the following staff: oncology and haemo-oncology, in wards and day patient areas including radiotherapy; in wards caring for people over 65 where the length of stay is over 3 months; in wards within mental health services where the anticipated length of stay is over 3 months. Uptake of PCR testing has been consistently high in these areas, at over 90%.

## Has uptake of testing changed over time? Does this differ by pathway?

Uptake of testing is difficult to measure as we know that not everyone records their test result. Population survey findings (YouGov polling) find that around 40% of people say they record their test results. This is an important caveat to the data gathered from testing across pathways and provided by Public Health Scotland.

In total, between 19 November 2020 and 27 June 2021, 6,650,650 LFD test results were recorded (Source: PHS weekly report). The number of tests recorded increases over time as shown in the chart below. During this time period, 809,310 individuals have recorded at least one test result.

Figure 1: Weekly number of LFD tests recorded November 2020 – June 2021




(Source: Public Health Scotland)

Some of the pathways have been able to provide more detailed information on uptake.

**Community Testing:** Uptake within the Community Testing pathway has generally also increased over time, as the graph below shows. This uptake data includes asymptomatic and symptomatic testing, however, so it is difficult to fully disaggregate the asymptomatic uptake (this data includes both Asymptomatic Testing Sites and Mobile Testing Units).

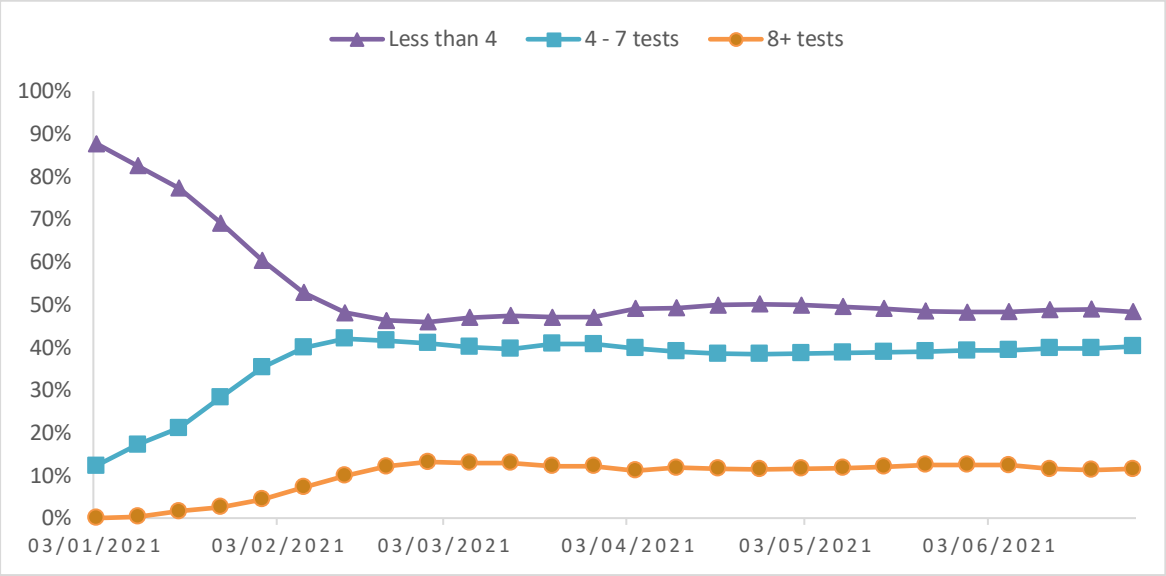
Figure 2: Weekly uptake of community testing over time, February – June 2021 (asymptomatic and symptomatic testing)


(Source: Public Health Scotland)

**Healthcare workers:** Looking at Healthcare workers specifically[14], over any 4 week period health care workers would be expected to take 8 LFD tests. Figure 2 shows that around 10% of eligible staff have been recording results to this extent. More staff are choosing to test and record results less than twice weekly. Staff may also be testing more than this data would suggest, but not recording results. It should also be noted that the number of staff testing has declined over this period from a peak of around 81,000 in mid-March to just over 52,000 at the end of June.

[14] The Health Care Workforce asymptomatic testing programme had a phased rollout. On 9th December 2020 interim guidance on expansion of twice weekly testing to patient facing staff within hospitals, the Scottish ambulance service and Covid-19 assessment centres was published. In January 2021 the programme was expanded to include the community workforce, district nurses and Covid-19 vaccinators, and then further expanded in February 2021 to include patient facing primary care staff (general practice, pharmacy, dentistry, optometry) as well as Scottish Ambulance Service and NHS24 call handlers. Finally, on 17th March 2021, the programme was expanded to all NHS staff.

Figure 3: Percentage of health care workers tested by number of tests from week ending 03/01/2021 - 27/06/2021




(Source: Public Health Scotland)

**Highest risk group:** From the 1,986 highest risk individuals who responded to an opt-in survey about the use of the universal offer in their household, over half (55%) indicated that they had ordered lateral flow tests after receiving a letter or text about the service from the Scottish Government. Of the 55% who had ordered tests, 34% said they took them as a one off, 25% said once a week, 40% said twice a week and 1% said more than twice a week. For adults who lived with those on the highest risk list, 33% said they took them as a one off, 25% said once a week, 41% said twice a week and 1% said more than twice a week.

**Police Scotland and SFRS:** The latest information available from partners (provided at the Board meeting on 7 June 2021) refers to 35%-40% uptake for PS staff. Similar evidence applies to SFRS.

**Prisons:** The Prisons pathway was able to provide data on the number and percentage of eligible staff consenting to take part in PCR testing since full rollout in May. This has been steady at around 40% in the weeks following. Staff mentioned some concerns about diminishing engagement, but over the period of the evaluation numbers were relatively steady.

Table 4: Number and percentage of eligible staff taking part in Prisons pathway testing (May-June 2021)[15]

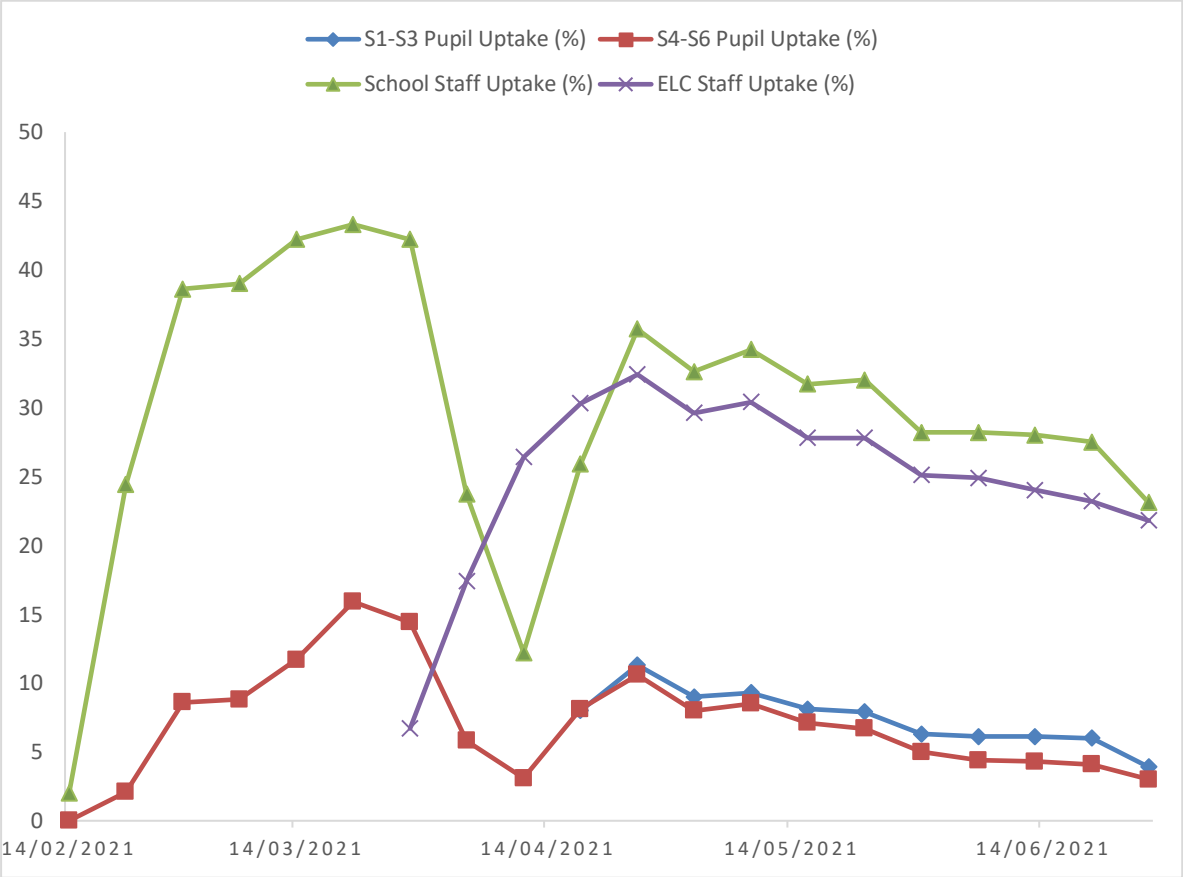
| **Week beginning** | 24-May | 31-May | 07-Jun | 14-Jun | 21-Jun | 28-Jun |
|---|---|---|---|---|---|---|
| **Number of eligible staff consenting (all eligible=5,157)** | 1,995 | 2,075 | 2,131 | 2,168 | 1,984 | 2,063 |
| **% of eligible staff consenting** | 39% | 40% | 41% | 42% | 38% | 40% |

(Source: NHS/Scottish Prison Service)

**Schools:** Figure 3 shows that testing uptake and/or reporting in schools has declined for staff, pupils and childcare workers. In mid-March, around 42% of staff were recording test results but by mid-June this dropped to 28%. Testing and reporting of results among pupils was considerably lower. However, our evidence suggests that it is likely people have been taking tests but not recording their positive results, and that there may have challenges for some in accessing the online portal, indicating that uptake may be higher than these figures suggest.

[15] The drop in June is due to staff in Scotland's two private prisons, Addiewell and Kilmarnock, moving to a different LFD testing pathway.

Figure 4: Testing for Covid-19: LFD testing uptake and reporting in schools (week ending 14 February 2021 – 27 June 2021)




(Source: Public Health Scotland)

**Universal offer:** The Scottish Government/YouGov survey of 1,000 members of the public conducted between 29-30 June asked about uptake of the universal offer. This found that 37% of people had accessed tests via the universal offer, 29% had used tests, 14% were testing at least once a week, and 9% were testing at least twice a week *and* had reported their last test result.

**University and College:** Responses to the survey in this pathway reported low demand, with the same students and staff returning regularly. Other responses stated that demand rose when people wanted to return home, go out or during local outbreaks. It was stated that home tests were preferred to on site testing. These results are set within a context of home testing not being available to universities until the start of the academic year 2021/22. Most students were also unable to return to in-person learning after the Christmas break in January 2021 due to the return to lockdown, which will have had a significant impact on uptake of on-campus asymptomatic testing.

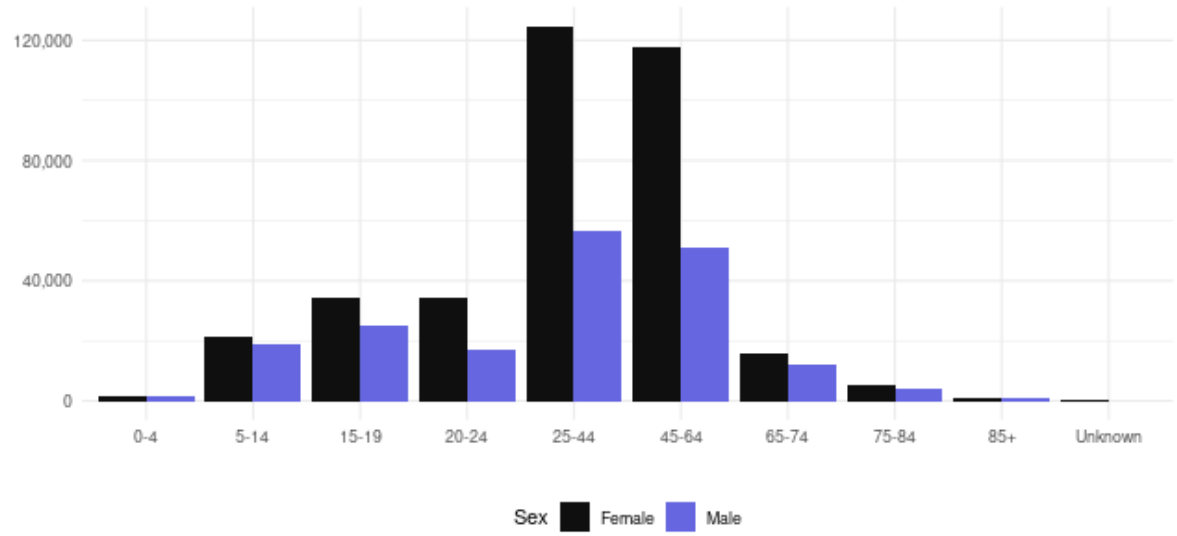
Overall, workplaces do seem to be a key site of engagement with asymptomatic testing, where the encouragement or requirement to test keeps people testing regularly and recording results. This appears to be particularly the case for the earlier testing pathways, set up before there was a wide range of options for testing. Those testing outwith work settings are more likely to use testing sporadically than as intended (i.e. twice weekly testing).

The time period of this evaluation covers the earlier stages of the asymptomatic testing programme – demand has much increased since, as the pathways have established themselves. We would therefore assume that further confirmed cases have been established by the overall programme and contributed to the aim of reducing negative outcomes from Covid-19.

## What is the profile of those tested and those that test positive in total and for each pathway? Is there a particular pathway that has a better 'reach'?

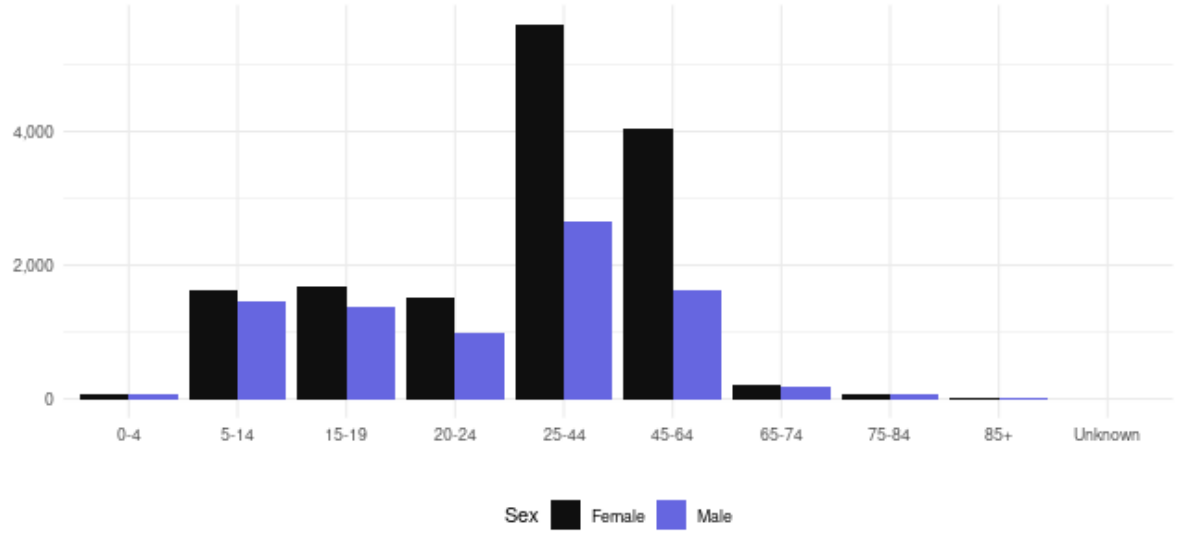
Overall, more women than men have recorded an LFD test result, and these are most likely to be aged 25-64. This may well reflect the larger number of women who work in schools, social care and health services and, potentially, gender differences in healthcare-seeking behaviours. More women have also recorded a positive test result.

Figure 5: Number of individuals recording at least one test result (positive or negative) by age and sex (November 2020 – June 2021)




(Source: Public Health Scotland)

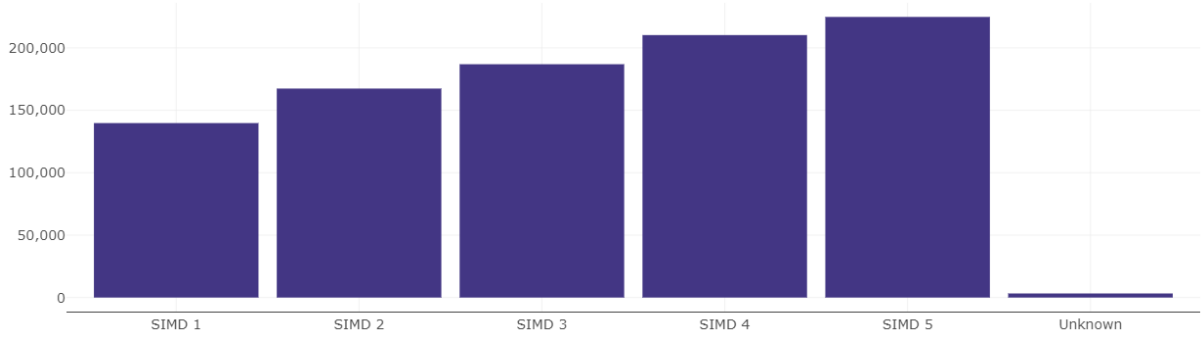
Figure 6: Number of individuals recording a positive test result by age and sex (November 2020 – June 2021)




(Source: Public Health Scotland)

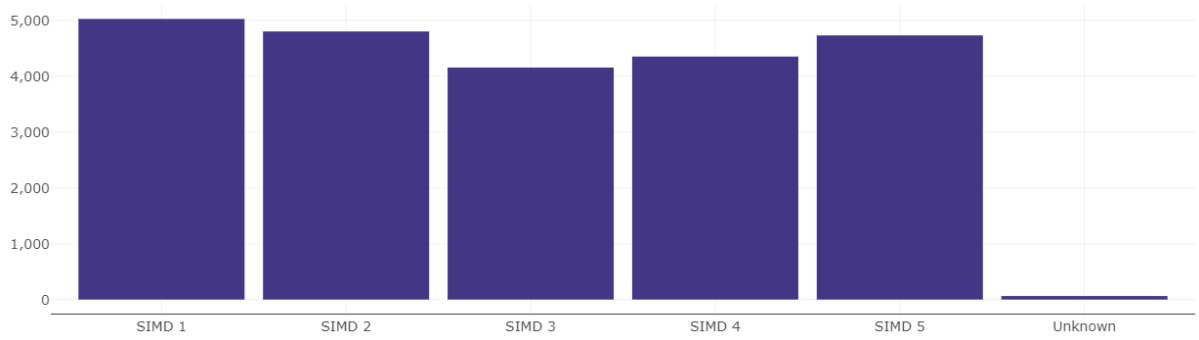
More people in the least deprived areas have recorded a test result, either positive or negative. However, more people in the most deprived areas have recorded a positive result.

Figure 7: Number of individuals recording at least one test result (positive or negative) by area of deprivation (November 2020 – June 2021)




(SIMD 1 = most deprived; SIMD 5 = least deprived)
(Source: Public Health Scotland)

Figure 8: Number of individuals recording a positive test by area of deprivation (November 2020 – June 2021)




(Source: Public Health Scotland)

Demographic data is not currently available for each pathway.

# Attitudes and Behaviours

## Introduction

This chapter explores attitudes towards and behaviours surrounding testing. All pathways have been able to return some data on attitudes and behaviours, though this varies in extent and quality of information.

Where surveys or other research into attitudes and behaviours has been undertaken it is important to bear in mind that this is not likely to be fully representative of the population being tested. Those people who have responded to the surveys are likely to be those who are more likely to be participating in testing and represent a more "engaged population". The only exception to this is the Scottish Government polling undertaken by YouGov, which provides a representative sample of Scottish adults aged 18 and over.

## Why are people taking up the offer of testing?

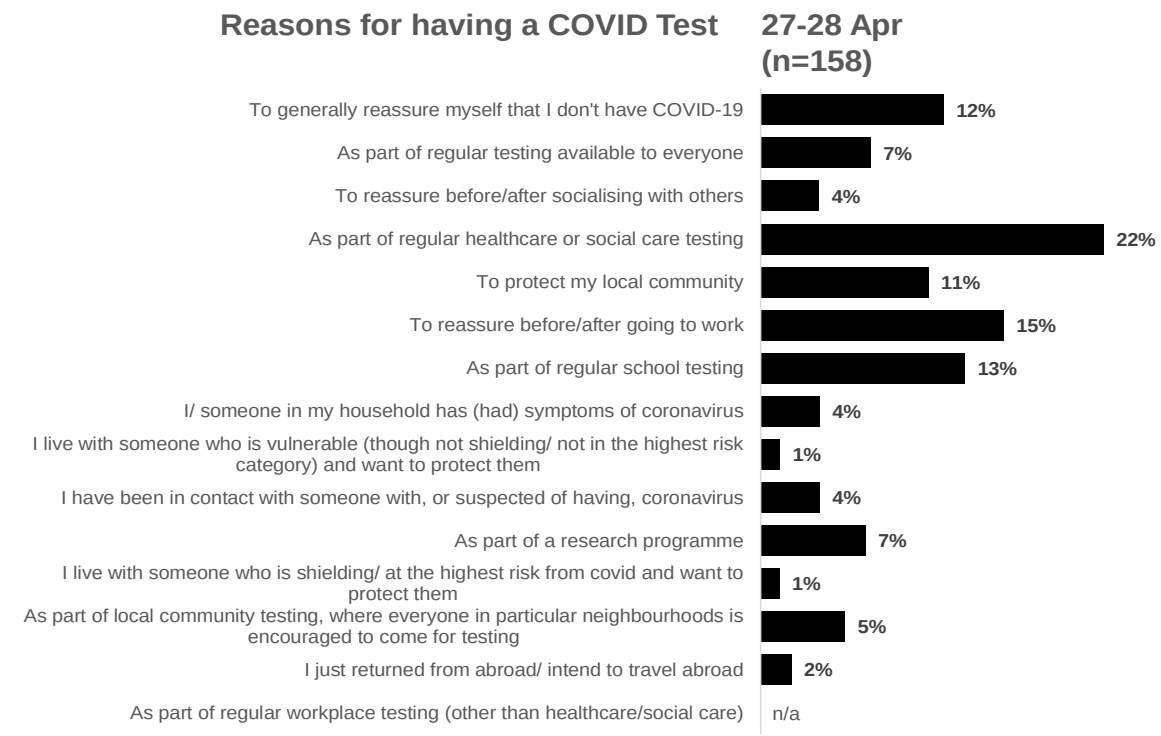
There are a wide range of reasons for getting tested, including:

- To generally reassure themselves that they do not have Covid-19
- Before/after socialising
- As part of workplace testing
- To prevent further outbreaks
- To protect the local community
- To keep and enable freedoms
- If have been in contact with a case or have symptoms (though this evaluation focuses on pathways designed for asymptomatic testing)

Evidence from the Scottish Government's regular polling[16] on reasons why people take a test can be seen below, covering these main reasons (for both symptomatic and asymptomatic testing), over time, in Figures 9, 10, and 11. More detail on four key themes for those taking up asymptomatic testing across the pathways is provided below.

[16] Weekly (now fortnightly) polling carried out by YouGov for Scottish Government. Sample of c.1000 adults 18+ across Scotland each week – representative of the population. Fieldwork carried out on mainly the dates shown (Tuesday-Wednesday in any week), with a small number of interviews carried out on the Thursday morning.

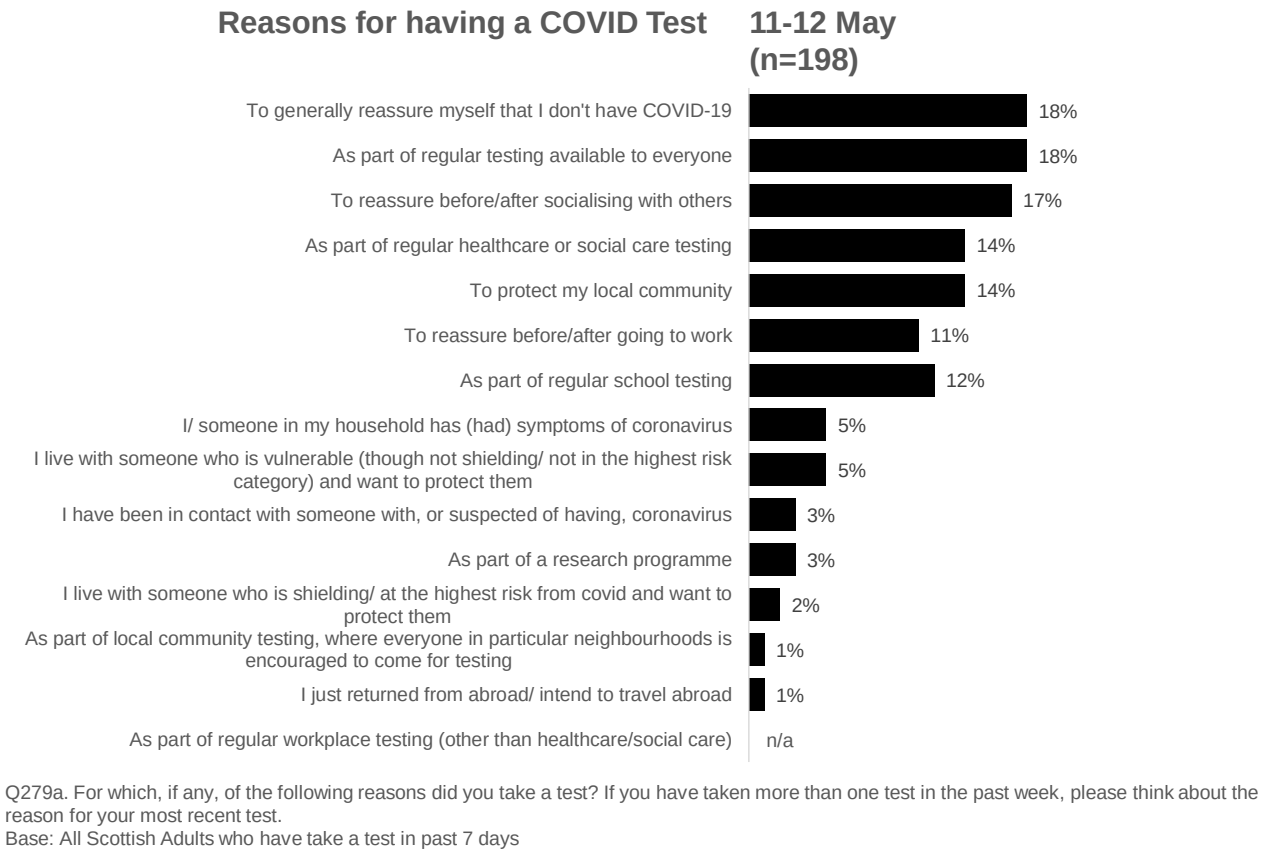
Figure 9: Reasons for having a Covid test in the last seven days (%), April 2021




Q279a. For which, if any, of the following reasons did you take a test? If you have taken more than one test in the past week, please think about the reason for your most recent test.
Base: All Scottish Adults who have take a test in past 7 days

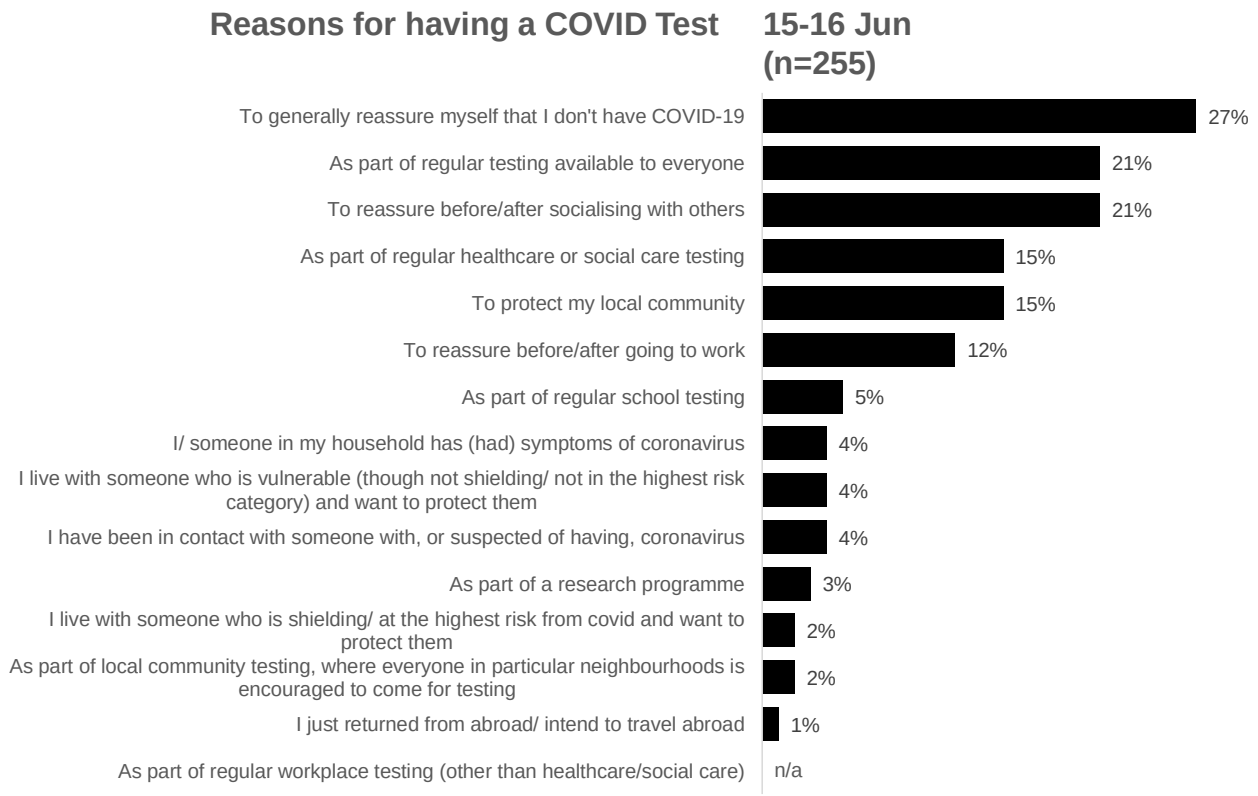
(Source: Scottish Government polling data – please note, this question covers both symptomatic and asymptomatic test)

Figure 10: Reasons for having a Covid test in the last seven days (%), May 2021




(Source: Scottish Government polling data – please note, this question covers both symptomatic and asymptomatic test)

Figure 11: Reasons for having a Covid test in the last seven days (%), June 2021




Q279a. For which, if any, of the following reasons did you take a test? If you have taken more than one test in the past week, please think about the reason for your most recent test.
Base: All Scottish Adults who have take a test in past 7 days

(Source: Scottish Government polling data – please note, this question covers both symptomatic and asymptomatic test)

## Reassurance

Individuals are **concerned about their risk of catching Covid-19** and are reassured by having access to asymptomatic testing to keep themselves, their families, and communities and workplaces safe. This relates to a desire to control the virus and reduce outbreaks. Indeed, 63% of participants responding to Scottish Government regular polling said they were reassured that universal testing is now open to everyone (1-2 June). Individuals taking part in the prisons pathway noted that they were not yet vaccinated and testing provided reassurance in the meantime. Please note again the time period that this evaluation covers: November 2020 to June 2021. Different cohorts were at different stages of being invited to vaccination over this period.

Reassurance was key to the highest risk group (formerly described as 'shielding') who noted that one of the main reasons to use regular testing was to reduce anxiety and that the universal testing offer had helped in this regard. Sixty-two percent of highest risk respondents reported a reduction in anxiety and 68% said their household's anxiety levels had reduced. Other benefits connected with reassurance were also mentioned:

- It offered me peace of mind and reassurance (70%)
- It made me feel more protected (55%)
- It helped me find out quickly if I had Covid-19 or not (55%)
- It helped me find out quickly if someone in my house had Covid-19 or not (46%)

Research conducted in England shows a similar sense of relief and reduced feelings of anxiety among those participating in asymptomatic testing, with participants feeling more confident going to school or work, or visiting vulnerable family and friends, knowing they were not spreading the virus. For more details, please refer to Annex B (p. 66). See also p. 80 for a study highlighting how testing is often used as a reassurance after risky situations rather than as a screening endeavour.

## Protecting others

Testing was cited as an important way of providing reassurance for the individual, but also of **protecting others from Covid-19 infection**. This could be family, friends, the local community, or workplace. Eighty-three percent of those responding to the school staff survey said they participate in regular asymptomatic testing to keep themselves and their household safe and 76% said it was to keep their school/childcare community safe. Seventy-three

percent of children and young people who responded to the survey for secondary school pupils said they participate to keep themselves and their families safe (with a lower percentage saying it was to keep their school community safe – 53%). Staff in the prisons testing pathway also wanted to act as a role model for prisoners and in doing so encourage greater testing uptake and protection across the prison estate.

Civic duty and the altruistic motivations of engaging in testing have also been identified as key drivers to getting tested in other UK studies. Annex B (p. 75 and pp. 79-80) presents some examples of how decisions to engage in testing programmes have been related by participants to pride in knowing that they were contributing to a collective pandemic response, a desire to protect the community and a belief that testing could help the return to normality.

### Practical considerations

There were also **more practical reasons** for taking part in asymptomatic testing. Participants in the prisons pathway (which provides asymptomatic PCR testing) noted that they may require a negative result as proof when going elsewhere (at the time this was a potential consideration for travel, for example). The Community Testing pathway also found that a reason some people attended a community test site was that they wanted to learn how to use the test kit under specialist guidance, before potentially doing so themselves at home via another pathway.

### Encouraged or required testing

**Work is a key place for people to test** and expectations from work encourage people to stick with the demands of regular twice- (and for some pathways, thrice-) weekly testing. For example, 52% of those responding to the school staff survey said they took part in testing because they had been encouraged to do so by the school and 90% of Social Care workers responding to the relevant evaluation survey were testing twice weekly and most recorded their results. The research from the community testing pathway also found that being 'sent' for a test by a workplace (or the NHS) was a reason given for attendance.

### Enablers of testing

Some pathways mentioned specific enablers of testing. These made testing easy and convenient. Participants in the prisons pathway noted many of these, saying they: found it easy to book tests; all their queries had been answered; they were well supported to carry out the first test; and they could

test quickly, privately and get results within 24 hours. Social Care staff said their employers had supported them to work through any barriers to testing they encountered, thereby enabling them to continue testing.

## Why are people not taking up the offer, or testing less frequently?

As with reasons *for* testing, the reasons for *not* taking up the various offers of asymptomatic testing are wide-ranging. These have been pulled into relevant themes below. To note, community testing is likely always to have mixed take-up as the amount of testing undertaken will depend on prevalence in local areas – it is not expected to maintain a constant steady rate as the aim is to target communities with increased or enduring transmission, or to protect at risk communities.

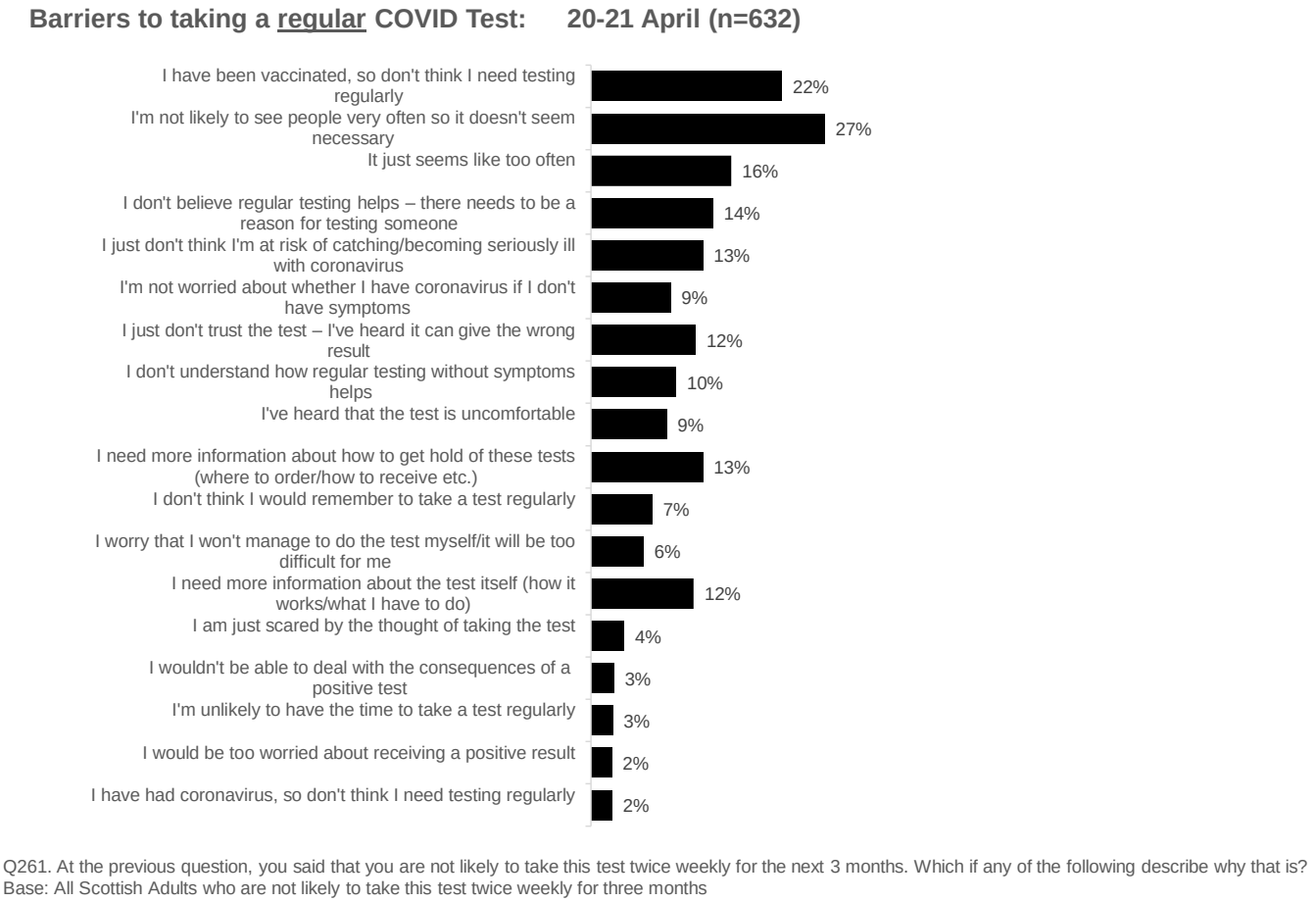
### Perceived lack of risk from the virus

Across pathways and for testing in general, **vaccination** is emerging as a key reason people give for not seeing themselves as requiring regular asymptomatic testing. This can be seen in Scottish Government polling, where 28% of people at 18-19 May selected this reason, but there was evidence in almost all pathways of this viewpoint.

Furthermore, the Scottish Government polling found that people may not see themselves as at great risk because they **do not see others often** or because they think they are **not at great risk of negative outcomes** even if they do contract the virus. See Figures 12 and 13 for views over time.

The link between testing and risk perception is further explored in the evidence review presented in Annex B. Perceiving oneself to be low risk has been associated with vaccination status, having had Covid-19 in the past and younger age groups (see p. 70). This risk perception does not necessarily correlate with a person's objective risk.

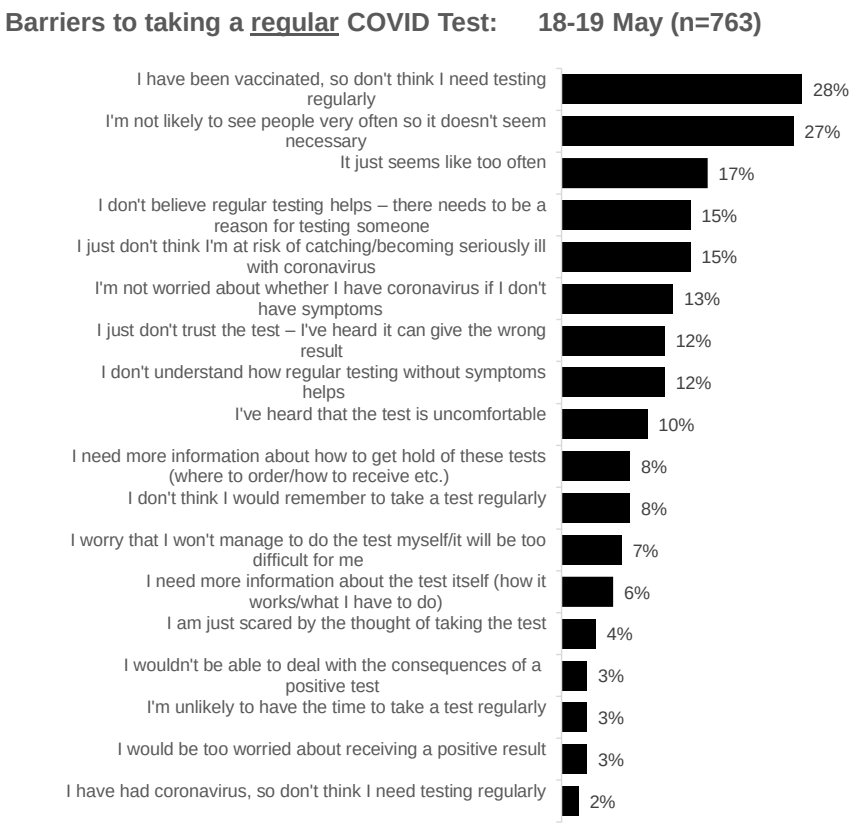
Figure 12: Barriers to taking regular asymptomatic testing (%), April 2021




Q261. At the previous question, you said that you are not likely to take this test twice weekly for the next 3 months. Which if any of the following describe why that is?
Base: All Scottish Adults who are not likely to take this test twice weekly for three months

(Source: Scottish Government polling data)

Figure 13: barriers to taking regular asymptomatic testing (%), May 2021




Q261. At the previous question, you said that you are not likely to take this test twice weekly for the next 3 months. Which if any of the following describe why that is?
Base: All Scottish Adults who are not likely to take this test twice weekly for three months

(Source: Scottish Government polling data)

## Concerns about the test

Across the Schools, Childcare, Health and Social Care workforce, and Community Testing pathways **test discomfort** is a consistent theme and a reason for being discouraged from testing or actively giving testing up. Furthermore, **concerns about the accuracy of the test** were also cited (see more below under 'Navigating the System'). This is also highlighted in the literature which suggests that a test that is seen not only as reliable, but quick, easy to administer, and less uncomfortable has higher chances of being done (see Annex B, p. 78).

The community testing pathway also found that some individuals were concerned about attending for a test because of the fear of infection at sites and on public transport.

## Practical considerations

The prisons pathway has seen fairly steady numbers of tests being taken throughout the period of evaluation (see Table 3). Where people signed up but have then not taken part in testing, reasons participants in this research gave are mainly practical, such as forgetting, running out of time on shift, or not being available when the testing was undertaken.

Police Scotland and Scottish Fire and Rescue Service colleagues noted a range of practical considerations, which include those mentioned above but also **problems with using the online portal to record results** (a common issue across pathways, discussed more below) and not having **time/capacity** to complete and/or record the result. The issue of time and capacity also emerged from the social care workforce research. The Police Scotland and Scottish Fire and Rescue Service pathway also found that regular testing had resulted in **'testing fatigue'**. Police Scotland and SFRS were careful to maintain directive communications encouraging testing and reporting in a communications style known to their staff. NHS Board leads concurred, stating that the main issue for them over the next 6-12 months would be maintaining motivation to test.

Furthermore, people may have been taking the tests, but not recording negative results. This is also a common concern and is discussed in more detail below. Several NHS Boards reported that staff found the results portal difficult to use and it took up too much staff time, leading to staff taking LFD tests but not recording results.

The excessive work burden emerges in the UK and international literature as one of the main barriers to testing. A number of studies discuss how testing programmes in the workplace have resulted in added responsibilities and increased workload for already over-burdened members of staff who are not consistently paid for time to get tested, sometimes resulting in poor adherence to LFD testing protocols. These issues are further explored in Annex B, p. 73 and pp. 74-75.

The University and College pathway also noted a decline in uptake after an engaged start and in often **cyclical demand** (e.g. demand on Fridays before weekend activities or going home or during local outbreaks). This decline is largely attributable to far fewer students and staff being allowed to return to in-person learning after the Christmas break in January 2021.

In the Schools testing pathway, qualitative feedback from parents suggests that asking pupils to collect tests from a school office may not work well in practice for everyone (e.g. they may forget). Another practical issue raised was that some young people may not have someone at home who can help them to do the tests (or they may lack encouragement at home).

**Confusion about pathways, or finding other pathways easier to access**, was also mentioned as a reason for not participating within a specific pathway by those in the Prisons, Police and Fire Service, and Community Testing pathways.

### Attitudes and understanding

Attitudes towards asymptomatic testing, including a sense of a lack of clarity around the benefits or understanding of the process could have a serious impact on uptake. In the Community Testing pathway there was concern that **the benefits of testing are not always clear** and, despite strong promotion of testing, this may mean people do not attend. Scottish Government polling found a stable fifth of people report not understanding how regular asymptomatic testing helps to stop the spread of Covid-19.

There is also some evidence arising from research with the highest risk cohort that some of that population may not understand that **LFD testing is currently only to be used when asymptomatic**. Some responses noted that they only intended to use the tests if they/their household became symptomatic. This is an important point that may extend beyond the highest risk cohort. Though the pathways evaluated here are intended for asymptomatic testing only it is likely that people do not necessarily always use them in this way, potentially using the universal offer, for example, as a means to check symptoms as they emerge. The fact we can see some suggestion of

this in the highest risk cohort is particularly important – communications about appropriate and best use of the different tests available is required.

A number of other UK and international studies reported that individuals find it difficult to understand differences between the PCR and LFD tests, why a test is needed in the absence of symptoms, and how and where to get tested. For a discussion of these barriers to testing, please see Annex B (pp. 68-69).

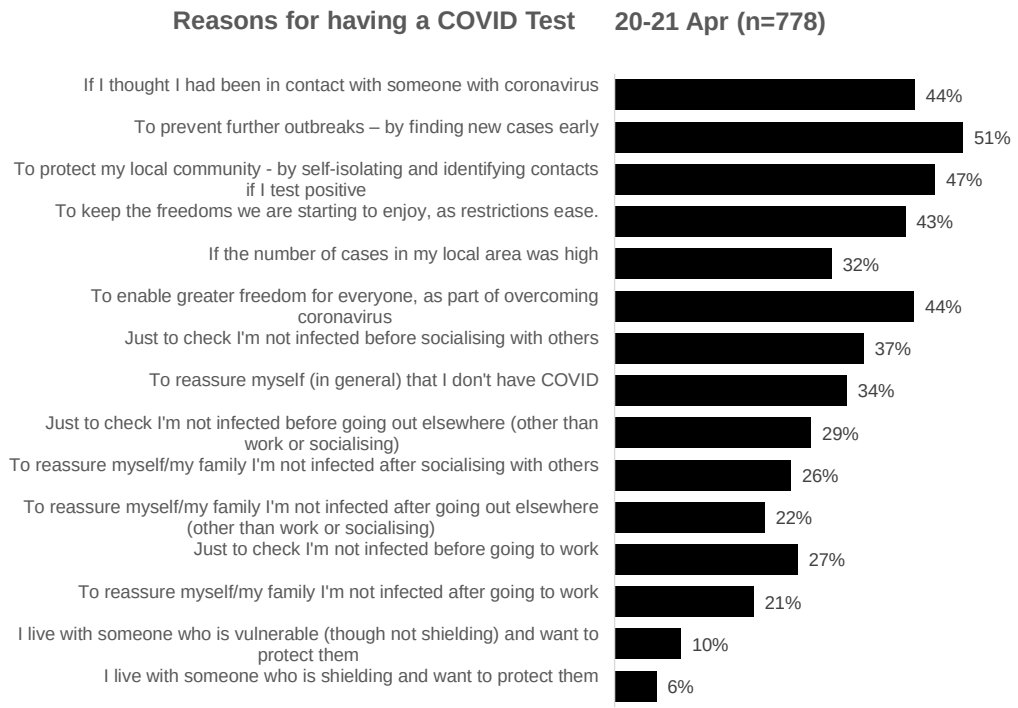
Although Scottish Government regular polling shows that the majority of people can see the theoretical benefits of regular testing, this does not necessarily translate into active participation. For example, looking at the universal offer, 37% of the sample said they had taken up this pathway (29-30 June), but then just 22% of this sub-sample were actually testing twice weekly with 16% using them about once a week, 20% saying they used the tests occasionally when they thought they had a reason to and a further 22% saying they had not yet used the tests at all (some of these people were saving them for a special occasion). This equates to just under one in ten of the Scottish population (8%) using the universal offer as intended (that is twice a week). This increases to 14% if those who test around once a week are also included. Polling data (18-19 May, n=763) found 17% of the Scottish population think **twice weekly testing is just too frequent**. The wider literature also highlights this issue and the importance of explaining to the public that lateral flow tests are more likely to detect positive cases when testing is frequent. For a detailed discussion on this point, see Annex B (p. 69).

From empirical research undertaken across pathways, it can also be seen there are also those who just do **not agree with the testing programme** and therefore choose not to participate (for example, seeing it as a waste of NHS resources).

### What would encourage testing uptake

When asked what would encourage participants who said they were unlikely to take part in asymptomatic testing to test, similar reasons are cited to those given by those willing to take part in testing: to prevent outbreaks, protect the local community, if local case numbers were high, and to keep or enable freedoms. The most common reason though, is if an individual thought they had been in contact with someone who has had Covid-19. See Figures 14 and 15 for views over time.

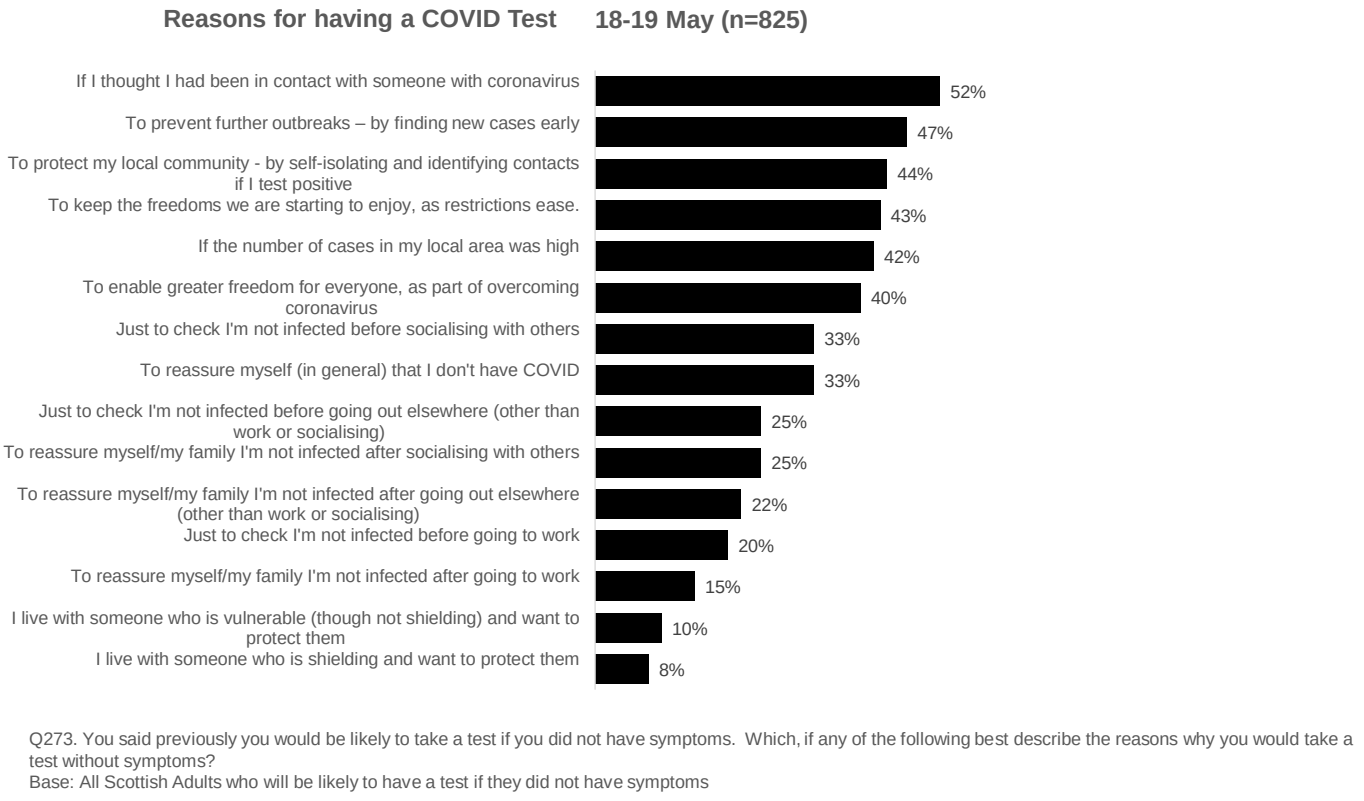
Figure 14: Reasons people would take a test without symptoms (%), April 2021




Q273. You said previously you would be likely to take a test if you did not have symptoms. Which, if any of the following best describe the reasons why you would take a test without symptoms?
Base: All Scottish Adults who will be likely to have a test if they did not have symptoms

(Source: Scottish Government polling data)

Figure 15: Reasons people would take a test without symptoms (%), May 2021




Q273. You said previously you would be likely to take a test if you did not have symptoms. Which, if any of the following best describe the reasons why you would take a test without symptoms?
Base: All Scottish Adults who will be likely to have a test if they did not have symptoms

(Source: Scottish Government polling data)

NHS Board leads shared some examples of good practice to encourage uptake, including sharing staff stories to increase engagement with testing; using peer to peer video messaging across different staff groups to enable staff to support one another; and having strong support for staff including training workshops, a dedicated point of contact for staff to ask questions, supportive leadership, and regular communications.

## Which channels are used and do people switch between channels?

Available data does not allow the evaluation to robustly explore whether participants in testing pathways use one or a range of channels. It also does not allow us to see if there may be specific pressure points or reasons why an individual may choose to 'switch' between testing channels.

However, evidence across the majority of pathways has found that the range of available testing options is confusing to people. The opening up of the universal offer has blurred the boundaries between pathways – people may use tests from the universal offer but record them as workplace results, or may use workplace testing but record as 'Other' on the online portal. It may not always be clear to someone turning up at a test centre for tests whether they are accessing the universal offer or community testing.

This blurring may put people off testing by making the process seem opaque and confusing, with expectations not being met. Partnerships in the Community Testing pathway think the universal offer has reduced footfall and created an expectation that people can pick up tests to take away without first conducting a supported test onsite. They feel the testing landscape could be simplified.

It also means that each pathway cannot be fully certain about the level of testing and recording of results within its domain as there may be crossover with other pathways. This is a limitation of the data and our understanding of the performance of testing across the piece. However, we recognise all testing potential contributes to case finding and is therefore a positive in public health terms.

## What were people's experiences of navigating the system?

Detailed information on models of delivery is provided in chapter 4. This section looks at comments from individuals who participated in our research about their experiences.

There were positive comments from participants in testing pathways about the testing system and its delivery. Over 80% of those responding to the survey for school and school-based childcare staff said they had been given information about testing and how to test, and almost all who had been given this information had found it useful. Fifty percent of staff taking part in the social care workforce research said their employer had helped to overcome any barriers they had faced. The social care workforce research also found that the majority of employers who responded felt satisfied with the testing programme as a whole, and viewed it as a helpful part of wider prevention strategies.

However, there were also a range of issues in navigating the testing system reported. Highest risk individuals noted difficulty in ordering tests online, though unfortunately no further detail was supplied. Participants in the University and College pathway also noted that registering on the NHS website was too lengthy and difficult a process for international students. However, the main concerns about navigating the system that were reported across pathways were **knowing what testing was available**, **carrying out tests**, and **recording test results**.

### Knowing what testing is available – information and communications

Though a minority of parents in the schools pathway said they did not have enough information on testing (2% of those who responded to the survey), other parents were keen to note that the system seemed useful and reassuring, but that there should be **greater communication about its availability and benefits** to counteract misinformation and peer pressure on children and young people not to take part. The need for clearer communication about the nature and the benefits of testing has been reported in other UK studies and is explored in Annex B, pp. 76-77.

Staff in childcare settings found information useful where available, but a small proportion of respondents indicated that they would have liked to receive guidance and **information in an alternative format**, including video with British Sign Language, audio format, Braille, or a language other than English. The importance of promoting equitable access to tests is further discussed in Annex B, p. 79.

For social care workers communication needs extended to the wider approach and overall guidance, where they were looking for:

- consistency between settings (social care vs NHS) and training materials (this may reflect the early implementation of testing in these settings, with change over time).

- A need for ongoing communication on accuracy and interpretation of tests and the purpose of testing as contexts change.

Several NHS board leads also noted the importance of national communications, with one noting that any lack of engagement from staff reflects that of the wider community, so testing communication need to also be targeted at that wider community and not just healthcare workers.

## Carrying out tests

There was **concern about the reliability and accuracy of tests results** and where there is lack of trust there is greater disengagement with programmes. For example, in the schools pathway, some parents were reporting hearing that the tests are only 50% effective. This incorrect information was resulting in them deciding not to keep children off school. This speaks to the previous point made by parents around concerns that misinformation was spreading about testing. Social care staff also wanted more information on the accuracy of the tests. In part this seems to be fuelled also by concern about taking the test correctly. The Scottish Government polling also finds that there is mixed confidence in asymptomatic self-administered test results in the population. When asked the extent of their agreement with the statement 'I am confident that self-administered tests give a reliable results', 32% agree/strongly agree, 31% disagree/strongly disagree, and 32% neither agree nor disagree (4-5 May).

This issue was cited (together with discomfort) as one of the top three barriers to testing in the Community Testing pathway:

- Worry about the test itself – this includes perceptions the test is unpleasant or uncertainty around how to carry out the test

Doubts about the accuracy of LFD tests have been reported in other studies (see Annex B, p. 69), and recommendations made on how to target such concerns, promote transparency and trust, and help dispel myths (pp. 76-77).

## Recording results

Recording results was brought up in several pathways as inconvenient and burdensome. Police Scotland and Scottish Fire and Rescue Service colleagues reported:

**'issues with recording the result on the online portal** (e.g. difficulties accessing the system with unique password provided, difficulties choosing the

unique organisation number (UON) when recording, having to re-insert personal details and/or UON repeatedly after first login etc.)'

Parents and guardians reported finding the **process of recording results** too time consuming, in particular the requirement to input their child's/children's details every time. Indeed some parents reported finding the process so frustrating that it was suggested that parents and families might give up and/or only record a positive result. There were calls to streamline the process to make it quicker and more straightforward to record test results – for example, by making it possible to create an account per child, to save having to enter the same information every time. Alongside creating accounts/storing details, one parent queried whether the testing programme could use QR codes, so that a pupil or parent could simply scan a test kit's unique code and select 'Positive' or 'Negative'.

Though most staff in the Social Care Workforce testing research had attended training that had made them more confident with the testing process, they said they would have liked more information on using the results portal. Those who said their experience of testing was negative were more likely to cite lack of information as a problem. It also takes time out of their day to record results and this was cited as a barrier to participation by employers/providers. It is worth noting that those in this pathway who said they were less positive about their overall experience of testing were also less likely to say they were still testing as often as when they started. NHS Board leads noted that the results portal was difficult to use, leading to staff disengaging and not recording results. Boards said that it is very difficult to re-engage staff to record the results once they have disengaged.

Pathways use different systems for reporting results and some pathways require registration prior to recording results. These different systems and approaches to reporting do appear to have had an impact on usability and satisfaction with the overall testing pathway.

Annex B examines reporting issues with recording results in the wider literature. This literature raises questions about the validity of collected data and the risk of spreading the virus, especially if positive results are not uploaded (pp. 67-68).

## How do people behave following a positive test result? What does this behaviour vary by and why? What do we know about specific groups?

There is very limited data on what people do after receiving positive results, but cautious comments can be made on the steps people take to record results, take a confirmatory PCR test, and self-isolate.

Following an asymptomatic LFD positive test result there are several steps an individual should follow. If positive, they should record the result, self-isolate immediately, and they should also book a confirmatory PCR test. People's behaviour at each step is key to understanding prevalence and reducing transmission.

From the available evidence, it does appear that people report positive results. There is greater agreement across pathways that this is important to do, whereas reporting negative and void results is not always seen as significant (more on behaviour after a negative result below).

In the schools pathway 1% of staff (49 respondents) and 1% of pupils (18 respondents) responding to the relevant surveys reported that they had received a positive result. Numbers responding as testing positive among children in the parent and pupil surveys were small. However, comparing surveys suggests that staff were more likely to take actions such as informing their school/setting, taking a confirmatory test, or immediately self-isolating than pupils were. Summaries of the relevant pupil and staff survey results are below:

Table 5: Action taken after a positive LFD test in schools pathway evaluation

| Reported action taken after a positive result | Secondary School Pupil Survey, percentage (and number) | Staff Survey, percentage (and number) |
|---|---|---|
| **Self-isolated immediately** | 44% (8 of 18) | 90% (44 of 49) |
| **Booked a confirmatory PCR test** | 28% (5 of 18) | 90% (44 of 49) |
| **Informed school/setting** | 56% (10 of 18) | 86% (42 of 49) |
| **Took another LFD test** | Less than 33% (fewer than 5 of 15) | 20% (10 of 49) |
| **Did none of the above actions** | Less than 33% (fewer than 5 of 15) | Less than 10% (fewer than 5 of 49) |

(Source: Schools Asymptomatic Testing Programme surveys)

The Scottish Government polling relating to the universal offer does not allow for good comparison between those testing negative and those testing positive as such a small sample tested positive. Only limited insight into the behaviours of the highest risk group can be gathered from available evidence as well, as only 2 respondents to the survey of nearly 2000 reported testing positive. These participants self-isolated at home and sought information and support from the Scottish Government website, the NHS website and from their Local Authority on what to do after getting a positive test.

As discussed in chapter 2, 72% of reported positive LFD results were followed up with a confirmatory PCR test. This does mean nearly 30% of reported positive LFD results were not followed up with a confirmatory PCR test.

Wider research by the Scottish Government into experiences of and compliance with self-isolation found that the majority of people report being fully compliant with self-isolation.[17] A measure of participants' compliance was gathered from whether they started isolating straight away, whether they left

[17] See: Coronavirus (COVID-19) support study experiences of and compliance with self-isolation: main report - gov.scot (www.gov.scot)

home for a disallowed activity during the 10 day isolation period, and how long they isolated for. Those who complied on all measures were categorised as 'fully compliant', while those who managed to comply on one or two measures, but not all three, were categorised as 'partially compliant'. Those who did not comply on any of the measures were 'non-compliant'. Seventy-four percent of index and contact cases report being fully compliant, 25% partially compliant, and 1% non-compliant.

Though most people report good compliance, there are some differences relating to 'partial compliance' and test result. (To note, when this research was carried out policy was that all contact cases must test during their self-isolation period, but should continue to isolate regardless of the result.) Those who test positive are more likely to be 'fully compliant' than those who test negative (80% versus 75%). Of those who are partially compliant, testing positive means they are *less likely* to isolate straight away (88% compared with 97%) and more likely to carry out a 'disallowed' activity *before* isolating (18% compared with 10%). They are then more likely to stay compliant for the remaining 10 days than those who test negative. This suggests that those who test positive are more likely to leave the house to do 'one last thing' before isolating fully.

## How do people behave following a negative test result?

There is very limited robust evidence on what people do following a negative test result, but some cautious comments can be made on reporting results and self-isolation.

Across pathways there is a concern that people are not reporting negative tests. For example, in the universal offer pathway, of those who had used a test, nearly 40% of them did not record their results online (29-30 June). An earlier survey wave (25-26 May) showed that of those who did not record their result online, no-one claimed to have tested positive.

More generally in the polling data, participants who reported not recording their result were asked their reason for not doing so (25-26 May, n=63), and the most commonly selected reason was **not knowing they had to (31%)**. Twenty-two percent said their result was recorded by their school or workplace, while 16% said they **didn't think it was important** to record the result. Fifteen percent said they **forgot to do so**, and 11% said they **did not know how to do so**. Please note, more than one answer could be selected so participants may have mentioned a mix of reasons. All of those who reported not recording their result said they had tested negative.

These reasons are common across testing pathways, with all pathways finding some evidence that negative results are being underreported. This is

also reported in other UK research (see Annex B, pp. 67-68). This suggests that there may not be enough information about the need to record negative test results and why this is important. More guidance and information could be provided to those testing on handling negative (and void) results.

Wider research into self-isolation and testing finds that contacts of cases, who test negative, are *more likely* than those testing positive to: leave home during the self-isolation period (14% left at least once for a non-test related activity, compared with 10% testing positive); and isolate for too few days (11% isolated for under 10 days when testing negative, compared with 1% of those testing positive).[18] Though people who test negative seem more inclined to start self-isolation immediately than those testing positive, ensuring that they complete the 10 days should be a key concern.

[18] Coronavirus (COVID-19) support study experiences of and compliance with self-isolation: main report - gov.scot (www.gov.scot)

# Models of Delivery

## What have delivery partners learned about the roll out of testing across pathways and how has that changed over time?

Due to the ever-evolving situation, it is challenging to assess the extent to which the implementation of different models of operation has been successful. Yet, some lessons on how to support and promote the testing programme have been learned. Models of operation are classified below in three main groups, together with the advantages and challenges that have been reported by the delivery partners.

### On-site testing

On-site testing was adopted as a model by the University and College pathway over the period of this evaluation. It should be noted that colleges moved in part to home testing from February 2021 and universities moved to community testing over the summer break, with home testing available from the start of the academic year 2021/22. A small minority of healthcare workers also use on-site testing, but the vast majority make use of home testing.

*Advantages:* on-site testing provides the benefit of protecting staff and students, while also enabling continuity with teaching and learning activities.

*Challenges:* challenges in the University and College pathway model revolved around capacity planning, storage and distribution of test kits, funding to cover costs incurred to set up and run a test centre, complexity surrounding cost recovery, resource and planning challenges due to staff working from home, and legal challenges with data protection. These issues are related to either how test sites have been set up and funded or the ability of universities to plan ahead for the correct amount of resource, utilise hall space for testing, and set up relevant processes under pressure.

Delivery partners in the University & College pathway have also indicated the importance of a **demand-led model** in their sector, based on comparing student and staff demand, weekly variations in demand (i.e. Fridays are busy with students testing before going home), and increased demand during outbreaks.

The evidence review presented in Annex B reveals how both the costs implied in running similar models (including personnel training and equipment, and use of facilities and services), and time and human costs (in terms of time

required to test and report results) have represented a challenge in the implementation of asymptomatic testing programmes in other contexts (pp. 74-75).

### Combination of fixed sites and popup and/or mobile options

A network of fixed test sites has been established for asymptomatic people who can both self-administer tests or get a trained helper to support them, with the addition of popup and/or mobile options available for drop-in or booked testing at varying targeted locations depending on need. This combined model has been adopted by many partnerships in Community Testing and in the Prisons pathways.

*Advantages*: fixed sites create a presence in a local area, advertising the programme to the targeted population. They have been seen as the most appropriate strategy to serve more populated areas, with a pool of trained staff that could be deployed flexibly in response to any increase in cases in the future.

Popup and/or mobile options present the benefit of offering an adaptable and rapid response where most needed, for instance with their deployment to specific places or organisations with an outbreak. When vehicle based mobile units are used, this strategy reduces issues with finding suitable venues.

Delivery partners in the Community Testing pathway report **data driven locations for sites** and **flexible and responsive models of operation** as important elements of their testing programme. An alternative model to this combination of fixed sites and popup/mobile units also demonstrates these features: Fire and Rescue Stations, despite being fixed locations, operate on rotation to adapt to where data show particular issues. Suggestions from this pathway to promote flexibility include: offering testing at community based events, targeting holiday spots, and exploring co-location with vaccination centres. A number of the partnerships noted how flexibility will also be key as restrictions ease and many previously used testing venues will return to business as usual.

*Challenges*: fixed sites are sometimes located where buildings are available and not necessarily where they are most needed, hence leaving some areas without adequate service.

### Home testing

Those willing to test at home can either collect the test from their workplace/school or get it delivered at home. This model has been adopted by

the Universal Testing, Health and Social Care Workforce, Police Scotland and Scottish Fire and Rescue Service, Highest Risk, Schools and ELC pathways. The University and College Pathway also saw colleges move to home testing in February 2021.

*Advantages*: home testing represents a convenient, time-effective means of testing.

Data from the YouGov Polling provided by the Universal Offer pathway show that at 4-5 May 60% of respondents (excluding those who said they would not use home testing) expressed a preference for 'self-administered tests ordered online and sent to my home', especially among the youngest age groups.

*Challenges*: home testing presents a number of challenges according to delivery partners in the Schools and ELC pathways. A lack of encouragement or practical support at home to do the tests for some secondary school pupils was identified by survey respondents as a potential barrier to testing uptake among young people. There was a suggestion from some parents that making on-site testing available at school might help to increase testing uptake.

**The tests being uncomfortable or unpleasant was also given as a reason for not continuing with testing by pupils.**[19] The challenges of administering LFD and PCR tests, seen sometimes as invasive and difficult to self-administer, as well as the emotional and physical challenges represented by swabbing younger children and people with disabilities, have also been reported in other UK research. For an examination of these aspects, refer to Annex B (p. 67).

Some delivery partners in the ELC pathway also suggested a greater role for local authorities as a possible improvement. Some representatives from ELC settings suggested that introducing additional staffing resource could better support the administrative delivery of the programme.

Some NHS Boards suggested that in the initial implementation phase they had experienced challenges with LFD ordering, storage, and distribution (these LFDs were then distributed for home use). However, they resolved these issues by creating local LFD kit collection hubs and identifying local service leads, reporting that this was key in implementing the initial phase of LFD testing.

[19] From the pupil survey: 5% of respondents said they were engaged with testing but did not plan to continue and the main reason given was the test being uncomfortable/unpleasant.

## Lessons learned

Some of the lessons learned refer to issues identified in more than one model of operation. In particular:

### Data

NHS Boards were clear about the importance of data and **access to local data** in particular. Having this data allows for planning and supporting targeted work in the local area. This was also mentioned in the Schools and Childcare pathways, where local authority representatives and staff (and parents) wanted information on testing results and trends to better understand the pandemic in their local area and to support their planning.

### Communication

The importance of **clear and streamlined communication** about the reasons why people should get tested and the ways to access and record tests has been underlined by the Community Testing, Schools, and University and College pathways. This perspective is supported by data provided by the Universal Testing pathway showing that at 1-2 June around a fifth (19%) of the YouGov Polling respondents did not understand how regular testing works. Similarly, research conducted in the UK stresses the importance of being clear about the nature and benefits of asymptomatic testing, by promoting awareness of what test results mean, the need to continue testing after being vaccinated or having Covid-19, and different kind of tests and their accuracy. In particular, informing the public of the rationale behind testing frequently (for instance, every 2–4 days) has been deemed key in improving testing uptake. For a discussion of these points, see Annex B (pp. 68-69 and pp. 76-77).

It has been suggested that communications take into account the **broad range of test users**, especially international students, and explain differences in guidance between Scotland and England (University and College); use a **range of media channels** and ensure Government websites are more user friendly (Community Testing).

Improvements in **communication in a range of areas** have also been recommended:

- Some delivery partners in the University & College pathway reported that the information provided (such as staff training packages) were helpful. However, others experienced a delay in the provision of central

communication packages which led to institutions having to create their own packages.

- Social Care Workforce survey respondents reported some issues with consistency of information, together with a desire for more information on test accuracy.

## Partnership working

**Engagement with the community and stakeholders** has been indicated as paramount to the successful implementation of the testing programmes. Community Testing has emphasised the importance of building relationships (including those with businesses/employers to encourage staff testing), using outreach teams, employing a community links worker and developing Covid-19 Empowerment Champions to reach non-engaged communities. Collaborative working has been reported as a positive experience by the delivery partners, including the opportunity to meet and work with new people.

Similarly, the University and College pathway reported that liaison and partnership working with other Universities, Public Health and the NHS contributed to the successful implementation of the programme.

These points are also highlighted by a number of UK studies suggesting that involving community leaders and stakeholder organisations in the development and implementation of testing programmes could help build trust, share goals, and bridge cultural and language gaps. Local community leaders and stakeholders have been found to play a fundamental role in determining behaviour change, with local organisations seen as answerable to local people, hence more trustworthy than national, more 'faceless' organisations. These studies are presented in Annex B, pp. 77-78.

## Inappropriate use of tests

**Clear information is needed about appropriate use of tests.** Although evidence is limited, partnerships in the Community Testing pathway suggested there was scope for inappropriate use of LFDs for individuals at increased risk who should be accessing PCR tests instead, such as symptomatic individuals and contacts of confirmed cases. Evidence from the research with the highest risk cohort also confirms this possibility.

The Highest Risk pathway also identified a potential issue with the rollout due to a high likelihood that tests were used beyond the scope of the service: while the aim of the programme was to use the tests for adult household/family members and not those on the highest risk list, 66% of people surveyed said they used the tests themselves.

## Complexity impacting footfall

**The existence of a number of pathways has been seen as a factor complicating the delivery of the programme.** Individuals did not always choose to use the pathway set up for them, which impacted delivery by creating a 'competition' for footfall. The University and College pathway found that administrative staff at the testing centres experienced a decrease in focus as engagement in testing decreased.

# Conclusions and next steps

Finding cases is the ultimate aim of the testing programme: reducing transmission and saving lives. By this measure, Scotland's asymptomatic testing pathways have performed well. Between 23 November 2020 and 25 June 2021, the number of positive cases identified by LFD testing and confirmed by PCR is 7,271. These are cases that may not otherwise have been detected in the absence of symptoms, or were identified earlier than they otherwise would have been via PCR-based testing once symptomatic.

There were also a range of other positives reported across the testing pathways and from the Scottish Government polling. People felt reassured by being able to access testing, including those in the highest risk cohort. There were also positive comments about receiving information and support to test within workplace settings and that any barriers to testing had been overcome. Employers were positive about testing as a means of keeping their staff and clients safe.

Nevertheless, a number of barriers to the maximum impact of the programme have been found. Individuals do not always have enough information and understanding of the benefits of regular asymptomatic testing. There are ongoing concerns about the accuracy and reliability of tests (even if these are not always based on accurate information), test discomfort, and problems navigating the system. The latter can impact on recording results. It is also clear from this evaluation that people do not necessarily report – or understand why they should report – negative or void results. There are a range of reasons for testing and not testing, including those attached to beliefs and values and more practical concerns. Some of these can be targeted to encourage greater uptake of testing or to alleviate barriers, including streamlining the reporting system, providing more information on carrying out tests and test accuracy, and focusing on the benefits of protecting the community.

A range of models for testing exist, and this evaluation finds that a combination of fixed sites and popup and/or mobile options, as well as home testing, have been described by delivery partners as having the most advantages. A range of lessons have been learned about delivery, including the need for local data to enable planning, clear and streamlined communication between delivery partners and other agencies, and information for those testing, tailored to different audiences. Simplifying the testing landscape may also increase uptake.

This evaluation has found reasons why people test, what enables testing, and what barriers to testing might exist. This information will help to support both practical interventions and communications messaging going forward.

As has been noted throughout, the extent and quality of data varies by pathway. Excepting the Scottish Government polling carried out by YouGov, the research that has been conducted to supplement the wider data is not representative of the groups being surveyed and the engagement shown may not reflect wider engagement across the pathway. Nevertheless, available data has been used to produce as robust and complete an evaluation as possible, draw out information on the performance and public health impact of the asymptomatic testing programme in Scotland, and identify areas that may benefit from improvement or changes.

# Annex A: Overview of the testing pathways included in this evaluation

| Pathway | Description |
|---|---|
| **Community Testing** | Community Testing offers both PCR and LFD asymptomatic testing (and symptomatic testing) to the general public, primarily in specific locations as determined by local authority and health board partnerships. |
| **Early Learning and Childcare** | Asymptomatic testing targets staff in 'standalone' (i.e. not attached to a school) early learning and childcare, and school-age childcare settings. All registered "Day Care of Children" settings have been included on a voluntary basis. Registered childminders were initially offered access to asymptomatic PCR testing but, since April, they have been encouraged to access the Universal Testing offer. |
| **Health and Social Care Workforce** | There was a phased roll out to NHS staff:<br>9/12/20 - publication of interim guidance on expansion of twice weekly testing to patient facing staff within hospitals, the Scottish Ambulance Service and Covid assessment centres<br>11/1/20 - expansion to include community workforce, district nurses and Covid vaccinators<br>15/2/21 - expansion to include patient facing primary care staff (general practice, pharmacy, dentistry, optometry) as well as SAS and NHS24 call handlers<br>17/3/21 - expansion to all NHS staff.<br><br>For the purposes of this evaluation the focus was on the earliest cohorts of social care staff to be offered testing: adult day care, day services, care at home, personal assistants, sheltered housing, housing with multiple occupancy and care homes. |
| **Highest Risk** | The pathway has been promoting the use of the Universal Testing offer among adults who live with someone on the highest risk list. |
| **Police Scotland and Scottish Fire and Rescue Service** | Asymptomatic testing is offered to staff members with specific roles within the two organisations (for example, control room staff, officers in custody sites or |

| | |
|---|---|
| | deployed in public order roles, Specialist Rescue Instructors, etc.). |
| **Prisons** | Over the period of the evaluation (Nov. 2020 – June 2021) the system of testing within the overall prison estate changed. Between November and May/June PCR-based tests were offered to all Scottish Prison Service Staff, staff at two private prisons, and partners working in Scottish Prison Service sites. However, in June 2021, Scotland's 2 private prisons moved to use a different LFD testing pathway. The evaluation focuses on the system used for the majority of the evaluation period, but the June figures at Table 4 are impacted by the move of Addiewell and Kilmarnock prisons to this other system – the small drop in percentage sign-ups is accounted for by removing private prison staff from the overall figures from this pathway. |
| **Schools** | Asymptomatic Testing targets all staff in primary, secondary, independent and special schools, and early learning and childcare settings which are attached to a school, together with secondary school pupils. (In relation to pupils, initially the testing programme targeted just senior pupils in S4-S6. With the full return to school after the Easter break, the schools LFD testing programme was extended to include secondary pupils in S1-S3 also.) |
| **Universal Testing** | The Universal Testing offer is available to the entire Scottish population to allow free, regular testing for everyone without symptoms. It is in addition to the other pathways, but intended to capture those who are not already testing regularly via their workplace, school, etc. |
| **University & College** | Asymptomatic testing has been offered to students who changed household for the winter break and returned to campus and to in-person learning. In the spring, the programme was expanded to allow more regular testing of the student and staff population who was active on campus. College students became eligible for LFD testing at home in late spring 2021, instead of using onsite testing. |

# Annex B: Asymptomatic testing. Evidence review of existing literature and current evaluations

## Executive Summary

### Introduction

In recent months, testing has increasingly been seen as a fundamental tool to detect pre- and asymptomatic transmission and contain the spread of Covid-19. Asymptomatic testing is a key part of the Scottish Government's testing strategy, as it is estimated that around 1 in 3 people have Covid-19 without displaying any symptoms. This asymptomatic testing strategy has mostly made use of lateral flow antigen tests (LFDs).

The purpose of this review is to provide an account of models of delivery, benefits, barriers, costs and impacts of asymptomatic testing regimes implemented both in the UK and the rest of the world, and to explore the lessons learned from these experiences.

### Methods

This evidence review is based on the analysis of evaluation work on testing pilots conducted in the UK, and international scholarly research selected through a standard literature review. The body of evidence consists of 73 studies. A search was conducted using Google Scholar, ScienceDirect, PubMed, and KandE, a Scottish Government online search engine covering several databases. Priority has been given to sources published in 2021, due to the rapid changes in scientific knowledge and availability of different kinds of test during the Covid-19 pandemic. A major limitation of the material is the difficulty in clearly distinguishing the effects of the testing strategies implemented from those of the other non-pharmaceutical interventions introduced at a similar time. There are also no control groups for robust comparison in the evidence reviewed. Finally, a substantial number of studies are models, hence relying on assumptions that may not play out in real life. At the time of the last search (29th June 2021), not all the scholarly research presented here had been peer-reviewed. Yet that has been included in this review as the process of formal publication can be lengthy and there is a need

to examine the available findings immediately, given the limited time for providing advice and the rapidly changing area of research.

### Research questions

The examination of the available evidence on testing strategies' outcomes is based on the following key research questions:

- What is the value/impact of the different testing models?
- What are the benefits of asymptomatic testing?
- What obstacles have testing regimes met?
- What are the financial and human costs of testing implementation?
- What are the practical and psychological impacts for the population tested?

### Key findings

The different types of testing regimes can be categorised as follows:

- **Universal testing offer.** From 26th April in Scotland and 9th April in England, free lateral flow test kits could be ordered online or by phone for home delivery from government websites, or picked up from many local walk-in or drive-through test sites. These kits are meant for people who do not already have access to asymptomatic testing in their workplace, school or community.
- **Surge testing.** This strategy offers targeted testing to anyone in a given small population of high prevalence, knocking door-to-door or testing whole settings in response to an outbreak.
- **Self-Collect model**. This regime has been implemented in a number of workplaces, schools and universities. Kits can either be collected from a specific location or received at home.
- **LFD testing with release for 24 hours**. This model, part of the 'test-to-enable' strategy being evaluated in England, presents an alternative to self-isolation for contact cases and aims at maintaining essential services. Staff members test themselves using a LFD each day for seven days and, if the result is negative, they are released from the requirement to isolate and allowed to undertake essential activities for the following 24 hours when the next test is due. **Testing through Mobile Testing Units (MTUs)**. This regime relies on MTU fleets to expand community testing provision and target hard-to-reach populations.
- **Pooled testing**. This strategy is mostly used in populations with low prevalence where pooling can be used to increase capacity and lower costs. By combining a number of samples into a pool and testing this pool

using a single PCR test, laboratories can test more samples, at the same time, with fewer resources.

- **Mass testing.** This strategy involves the testing of the whole national population or the population of a specific extended area within a short period of time. It has been adopted both in high prevalence contexts to reduce transmission to more manageable levels, and in low prevalence settings to stop community transmission through early identification of cases.

Almost all the sources examined in this review mention the same benefits of asymptomatic testing, which can be summed up as:

- **Rapid detection of hidden cases**. Asymptomatic testing serves the aim of identifying cases that would not otherwise have been detected in the absence of symptoms, or identifying them earlier than they otherwise would have been via PCR-based testing once symptomatic. By increasing the frequency of repeat testing over short periods of time, LFD tests have the potential to detect a higher number of cases. They also provide near instantaneous results, hence facilitating the timely isolation of the most infectious cases who may otherwise transmit infection while waiting for a PCR result (this can take up to 6 days).
- **Participant wellbeing**. LFD home testing reduces access barriers to testing (for instance, for older people or those with mobility concerns) and health risks associated with venue-based testing due to viral exposure from/to others. Asymptomatic testing based on the 'test-to-enable' model allows participants to benefit from being able to continue working and from reduced chances of having to self-isolate. Finally, negative test results can provide reassurance.
- **Time and cost savings**. LFD test kits are relatively inexpensive and provide results rapidly. Depending on the model of delivery, asymptomatic testing also has the potential to reduce unnecessary self-isolation when contact-traced, hence reducing work absences and the costs of sick pay associated with them. Furthermore, it can reduce the strain on laboratories that conduct PCR–based testing and cut healthcare costs by reducing the need for trained providers. Finally, it can positively impact on infections and hospitalizations.

The sources examined in this evidence review report some obstacles met by testing regimes that can impede their success. These are:

- **Reluctance in taking LFD tests**. Participants in a number of trials reported concerns regarding the tests, which they considered invasive and difficult to self-administer. Moreover, swabbing younger children and

people with disabilities has been seen as an emotional and physical challenge for which many felt unprepared.

- **Failure to upload test results**. Testing participants may not upload their results or may upload them incorrectly.
- **Risk that positive LFD tests are not followed by PCR tests**. This could be due to a number of reasons, ranging from lack of time to lack of faith in test reliability.
- **Failure to perform the test correctly.** Self-testing requires skill, and swabs taken by untrained individuals are more likely to give false negative results.
- **Lack of knowledge and misconceptions about testing**. Some pilots report that individuals find it difficult to understand differences between PCR and LFD tests, and why a test is needed in the absence of symptoms. Lateral flow tests are more likely to detect positive cases when viral loads are highest and patients are most infectious. However, as this window is narrow, they are most suitable when testing is frequent. Informing the public about the reasons for frequent testing (every 2–4 days) may improve testing uptake.
- **Perception of being low risk**. For those groups who already feel their risk is low, regardless of their objective risk, negative results could falsely reassure people there is no risk of being infectious, reduce adherence to the guidelines, and increase the spread of Covid-19 as a result. In particular, perceiving oneself to be low risk can apply to those who have received their vaccine, have had Covid-19 in the past or to younger age groups.
- **Language and digital access barriers**. Testing participants might find it hard to interpret information on testing due to both language and digital access barriers. Some pilots suggest this could account for the lower uptake rate for potential participants from BAME and other backgrounds.
- **Financial and psychological barriers to receiving a positive test**. People may have concerns at having to self-isolate, being unable to work, the impacts on their household life, and being stigmatised if they test positive. The risk of false-positive findings may also lead to needless isolation and unnecessary psychological distress. For individuals within deprived areas, self-isolation tends to have a direct impact on remuneration and employment security.
- **Lack of trust**. A lack of trust in government has been identified as one of the main reasons some choose not to take part in testing programmes. Government intentions about use of personal data have been identified as a cause of concern, especially in deprived areas.

- **Test access**. Reluctance to get tested might also pertain to concerns about testing centre location, time lost taking the test, concerns over queuing and the logistics of home testing.
- **Inadequate training or excessive work burden**. A number of studies have reported how the testing programmes in the workplace have resulted in added responsibilities and increased workload for members of staff. A lack of guidance and potential loss of knowledge through cascade training have also been identified as barriers.

As for the costs involved in sustained testing regimes, these include:

- **Costs of test kits**. LFD devices are an affordable alternative to PCR tests. However, some participants might find it difficult to do the test properly. This means multiple swabs might be needed and unopened test kits wasted. The provision of a stock of swabs together with test kits could solve the issue.
- **Costs to run the model**. This includes the costs of setting up and administering the programme, including personnel training and equipment, and use of facilities and services. Estimates of the cost-benefit ratio of testing programmes vary per country. An article based on estimates published in the British Medical Journal calculated in March 2021 that, if tests delivery costs in England were £10-20 and only one test in 1500 comes back positive, that would amount to £15 000-£30 000 to detect one case, with a risk that this could be a false positive.[20] However, the evaluation of the Welsh pilot in Merthyr Tydfil and the lower Cynon Valley found the intervention cost effective, with a central estimate of £2292 per QALY (quality-adjusted life years) gained.[21]
- **Time and human costs**. Regular asymptomatic testing has the potential to avert infections, hence reduce workdays lost due to sickness. On the other hand, a false positive test could result in staff being removed from the workforce, unnecessary tests and possible isolation for colleagues linked to them. This could exacerbate staffing shortages and require further resources and time to manage suspected outbreaks.

The existing literature offers important reflections on attitudes towards and experiences of testing in relevant testing populations:

- **Willingness to participate was high.** Participants reported multiple reasons for wanting to take part in testing regimes, such as the desire to

[20] What do we know about lateral flow tests and mass testing in schools? | The BMJ (oclc.org)
[21] Evaluation of the Lateral Flow Device Testing Pilot for COVID-19 in Merthyr Tydfil and the lower Cynon Valley (cwmtafmorgannwg.wales)

know whether they were infected, a sense of duty to society as a whole, and a feeling of obligation to keep working and help tackle the virus.

- **Testing uptake and compliance with recording results is mixed.** Some of the pilots show encouraging uptake and engagement, but others find barriers remain.
- **Personal experiences of testing are complex**. The sources analysed report a number of challenges: booking errors, a lack of slots in specific areas, and difficulties in reaching testing centres. Moreover, people seem to see testing as a process rather than a discrete technical event, entailing a significant burden of time, energy, and resources for the individual and their relatives/friends.

### Lessons learned

Some of the lessons learned from the experiences within the sources examined are:

- **Testing communications should be clear about the nature and benefits of testing**. It is key that everyone understands that asymptomatic cases can still spread the virus, and that the confusion around the need to continue testing after being vaccinated or having Covid-19 is addressed. Concerns about test accuracy should also be targeted, and more information about different kinds of tests provided. Informing the public of the rationale behind testing frequently (for instance, to every 2–4 days) would address this concern and might improve testing uptake. Communication should also promote awareness of what test results mean, and particular attention given to negative results. It is important to avoid conflicting messaging that may confuse the public. In England, people who received a negative result were told it was "great news" in some settings, while in others that "you were not infectious when the test was done", with varying time periods suggested for continued testing.
- **Involving community leaders and stakeholder organisations in the development and implementation of testing programmes could help build trust, share goals, and bridge cultural and language gaps**. Some pilots found that local community leaders and stakeholders had a fundamental role in determining behaviour change. Local organisations were perceived as answerable to local people, hence more trustworthy than national, more 'faceless' organisations such as NHS Test and Trace in England.

- **Less invasive sampling techniques could increase uptake.** Willingness to participate in testing could be higher if less invasive sampling techniques (such as saliva sampling) are provided.
- **The context of use requires careful consideration**. The disconnect between the prescribed testing regime and the actual context of use should be addressed. Some testing regimes requiring employees or employers to get tested multiple times a week are not compatible with their working schedule and pose a high risk of increased staff dissatisfaction, and consequently staff turnover and burnout. In some settings, on-site testing can be organisationally complex and resource-intensive.
- **Equitable access to tests should be promoted.** Individuals who face additional barriers to testing, such as language barriers and/or digital exclusion, should be addressed by tailored campaigns. People should be told how to collect, book or perform a test by means of a range of media channels and formats. In low-literacy populations that might have trouble understanding written or graphic instruction materials, the use of online videos could be an option. On the other hand, as internet-based dissemination may limit access for some segments of the population and require a proactive individual seeking information, it is key to explore other routes, such as promotion of testing through commercial sites or community-based organisations.
- **Psychological and behavioural consequences of test results may impact uptake**. Testing programmes rely on members of the public undertaking a substantial burden of responsibility across the testing stages. Using a language that acknowledges the challenges people face and emphasising the contributions of individual actions to a societal response may increases uptake.
- **Emphasising civic duty and the altruistic motivations of engaging in testing may be successful strategies to promote testing**. A communication strategy that focuses on protecting others and reducing the impact of the pandemic for society as a whole has already demonstrated its value in other areas, such as vaccination and compliance with regulations.
- **Research on the underlying motivations that lead people to get a test when asymptomatic would aid the design of effective health communication and successful implementation of testing strategies.** Exploring the reasons for use of testing could shed further light on how individuals in Scotland are using the testing pathways open to them (see

Asymptomatic Testing Evaluation for more details on testing behaviours and motivations).

# Asymptomatic Testing – An Evidence Review of the Existing Literature and Current Evaluations

## Introduction

In recent months, testing has increasingly been seen as a fundamental tool to detect pre- and asymptomatic transmission and contain the spread of Covid-19. The Scottish Government has set out its approach to testing in Scotland's Testing Strategy, as part of the wider set of public health measures for the management of the pandemic[22]. With the implementation of a range of testing regimes in different settings, a number of studies have assessed the barriers to intended outcomes from these regimes and suggested strategies to improve effectiveness. The purpose of this review is to provide an account of these studies carried out both in the UK and the rest of the world. This review also aims to explore the lessons that have been learned from previous and current experiences, and to examine what recommendations have been made to promote the adoption of successful testing interventions.

## Background

Asymptomatic testing has been implemented as an infection control measure in a number of countries as part of the response to Covid-19. It has mostly made use of lateral flow antigen tests (LFDs) which can provide results within 30 minutes and significantly reduce costs and waiting times associated with polymerase chain reaction (PCR) testing. LFDs have also been adopted with the purpose of detecting and containing hidden infections, as it is estimated that around 1 in 3 people have Covid-19 without displaying any symptoms. The detection of asymptomatic individuals is meant to ensure prompt isolation of infectious cases, while also protecting others from being infected and maintaining vital services. As a negative result does not mean that there is no risk of being infectious, people should continue to follow the guidelines and restrictions in place.

## Methods

This evidence review is based on a process of searching for and assessing material which can be divided into two main categories: evaluation work conducted in the UK and scholarly research.

[22] Coronavirus (COVID-19): Scotland's testing strategy - adapting to the pandemic - gov.scot (www.gov.scot)

The evaluation material has been provided by a variety of government sources and analyses just recently concluded or ongoing testing pilots across the UK. The majority of these evaluations are process evaluations, namely they include ongoing insight to help reassess the work and improve the intervention being delivered, rather than summative evaluations conducted at the end of delivery. These have been conducted mostly using quantitative methods (such as surveys or data analysis), although some work has also relied on qualitative methods (such as interviews and focus groups).

As for the scholarly research, a standard literature review has been undertaken, searching for relevant literature from across the globe. A first search was conducted using KandE, a Scottish Government online search engine covering several databases. Subsequently, a search was carried out on Google Scholar, ScienceDirect and PubMed. Search terms included “testing”, “mass testing”, “Covid”, “coronavirus”, “asymptomatic”, and “evaluation”. Further references have been added by means of the snowballing technique, where references in relevant studies are reviewed for additional evidence. Only sources pertaining to Covid-19 (as opposed to testing regimes for other disease) have been included.

Priority has been given to sources published in 2021, due to the rapid changes in scientific knowledge and availability of different kinds of test during the Covid-19 pandemic, though some relevant material from 2020 is also included. Evaluations were prioritised for review to assess practical models and their implementation. For the purposes of the current project, assessment of reliability and scientific comparison between different kinds of test are also out of scope.

The body of evidence selected in this reviews consists of 73 studies. Most of the scholarly research uses robust research methods. Yet, a substantial number of the evaluations included in this evidence review are models, rather than evaluations of implemented testing regimes, hence relying on assumptions that may not occur in real life. Together with this, another limit of the material remains the difficulty in clearly distinguishing the effects of the testing strategies implemented from those of the other non-pharmaceutical interventions introduced at a similar time. There are also no control groups for robust comparison in the evidence reviewed[23]. Finally, not all the scholarly research presented here has been peer-reviewed: some was in the form of preprints at the time of the last search (29th June 2021). Nonetheless, that has been included as the process of formal publication in a scholarly journal can be lengthy and there is a need to see and discuss the available findings immediately, given the limited time for providing advice and the rapidly changing area of research.

[23] Increased Intensity Of PCR Testing Reduced COVID-19 Transmission Within Countries During The First Pandemic Wave | Health Affairs

Although the geographical coverage of the scholarly research material was international, this review was limited to resources in English. This partly justifies the higher number of UK based studies included in this review, the other reason being the wider use of LFD tests in the UK compared to other countries.

The evidence discussed in this review should be considered in the context of these limitations.

**Terminology**

Effective Covid-19 control is increasingly relying on testing of pre- and asymptomatic cases. Generally, regular testing has been adopted in specific settings, for instance in schools and care homes. More recently, free lateral flow test kits have been made available for everyone in Scotland who does not have Covid-19 symptoms as the "universally accessible offer". It has to be noted that there is not an agreed definition for "universal testing" in the existing literature and in some studies this is used to identify testing regimes targeting specific groups of people (e.g. students, healthcare workers, or prisoners)[24]. These ambiguities also extend to the variability in the use of the definition of "mass testing", sometimes used to refer to the national population and again also sometimes to specific categories of people. In this review the term "universal**"** is used to refer to the universally accessible offer, or equivalent testing strategies, that give any individual in the community the opportunity to get free tests on a regular basis.

**Research questions**

The examination of the available evidence on testing strategies' outcomes, in terms of the successes and barriers to implementation and/or uptake is based on the following key research questions:

- What is the value/impact of the different testing models?
- What are the benefits of asymptomatic testing?
- What obstacles have testing regimes met?
- What are the costs of testing implementation (for example, costs for the government, impact on the population)?
- What are the practical and psychological impacts for the population tested?
- Are hard-to-reach (e.g. non-digital, geographically remote) individuals able to access the tests and how do we ensure equal accessibility?

[24] Lessons learnt in transitioning from universal screening to universal testing of pregnant patients for SARS-CoV-2 at the largest municipal health system in America | Journal of Perinatology (nature.com)

## Key findings

This section will report key findings both from the evaluation work conducted in the UK and the scholarly research on testing examined here. First, it will introduce the different kinds of testing regimes that have been adopted in a number of settings and countries, together with their models of operation and delivery. Then, it will focus on the benefits of asymptomatic testing, the barriers to it and the costs involved in its implementation. Finally, it will explore attitudes towards and experiences of testing in relevant populations.

The different types of testing regimes can be categorised as follows:

- **Universal testing offer.** From 26th April in Scotland and 9th April in England, free lateral flow test kits could be ordered online or by phone for home delivery from government websites, or picked up from many local walk-in or drive-through test sites. These kits are meant for people without Covid-19 symptoms who do not already have access to asymptomatic testing in their workplace, school or community[25] [26]. Each kit contains 7 LFDs. The NHS recommends taking a test twice a week (every 3 to 4 days) to check if one has the virus[27].
- **Surge testing.** This strategy offers targeted testing to anyone in a given small population of high prevalence, knocking door-to-door or testing whole settings in response to an outbreak. It has the potential to find cases early and reduce onward transmission and spill over into the wider community, hence reducing overall community transmission[28].
- **Self-Collect model**. This regime has been implemented in a number of workplaces, schools and universities. Kits are offered by the employer or the organisation and can be either collected from a specific location or received at home.
- **LFD testing with release for 24 hours**. This model, part of the 'test-to-enable' strategy being evaluated in England, presents an alternative to self-isolation for contact cases and aims at maintaining essential services. In this model, staff members test themselves using a LFD each day for seven days and, if the result is negative, they are released from the requirement to isolate and allowed to undertake essential activities for the following 24 hours when the next test is due. A two-arm randomised control trial of a sample of contacts of confirmed cases of Covid-19 has also been run in England to test the

[25] Regular rapid testing for everyone - gov.scot (www.gov.scot)
[26] Order coronavirus (COVID-19) rapid lateral flow tests - GOV.UK (www.gov.uk)
[27] Regular rapid lateral flow coronavirus (COVID-19) tests - NHS (www.nhs.uk)
[28] Surge testing for new coronavirus (COVID-19) variants - GOV.UK (www.gov.uk)

hypothesis that daily testing with lateral flow devices with release for 24 hours is non-inferior to a single PCR test and isolation for 10 days[29].

- **Testing through Mobile Testing Units (MTUs)**. This regime relies on MTU fleets to expand community testing provision and target hard-to-reach populations. The Targeted Community Testing pathway in Scotland, for example, widely utilised mobile testing units, buses and lorries, and other temporary locations set up as asymptomatic testing sites to provide an adaptable and rapid response in specific circumstances (e.g., with their deployment to places or organisations with an outbreak or in locations lacking suitable venues).
- **Pooled testing**. This testing regime is mostly used in populations with low Covid-19 prevalence where pooling can be used to increase capacity and lower costs[30]. By combining a number of samples into a pool and testing this pool using a single PCR test, laboratories can test more samples, at the same time, with fewer resources (reagents and personnel time)[31] [32]. This testing model has been used in the past for the detection of the human immunodeficiency virus and hepatitis B/C viruses in blood products. It has the capability of providing a good estimate of the actual incidence of a virus, and the heterogeneity of this incidence in terms of geography and age[33] [34].

  Pooled testing of asymptomatic individuals has been adopted in England, where a pilot is currently exploring its use in university student households[35], and in Scotland at the end of 2020 for a 'proof-of-concept' pilot. Pooled testing is currently being evaluated within NHS Scotland for its potential use in large-scale testing.

  Although pooled testing can contribute to informing public health policy and resource allocation, it presents a particular barrier when applied to the current pandemic: as each individual belonging to a positive pool is asked to self-isolate even if they are negative, this might result in lower compliance rates[36].

[29] Browse the Registry - Research Registry
[30] COVID-19 testing: One size does not fit all | Science (sciencemag.org)
[31] Pooled testing with replication as a mass testing strategy for the COVID-19 pandemics | Scientific Reports (nature.com)
[32] A discussion on implementing pooling detection tests of novel coronavirus (SARS-CoV-2) for a large population | Epidemiology & Infection | Cambridge Core
[33] Assessing the feasibility and effectiveness of household-pooled universal testing to control COVID-19 epidemics (plos.org)
[34] Evaluation of sample pooling for diagnosis of COVID-19 by real time-PCR: A resource-saving combat strategy - Garg - 2021 - Journal of Medical Virology - Wiley Online Library
[35] Pooled testing for coronavirus (COVID-19) pilot: guidance for university students - GOV.UK (www.gov.uk)
[36] Assessing the feasibility and effectiveness of household-pooled universal testing to control COVID-19 epidemics (plos.org)

- **Mass testing.** This strategy involves the testing of the whole national population or the population of a specific extended area within a short period of time. It has been adopted both in high prevalence contexts to reduce transmission to more manageable levels, and in low prevalence settings to stop community transmission through early identification of cases. Examples of mass testing are the campaigns implemented in Slovakia[37], the Faroe Islands[38], in Liverpool[39], in Merthyr Tydfil and in the lower Cynon Valley (Wales)[40] and the Italian region of South-Tyrol[41].

  Mass testing presents limitations: first, when the screening begins, approximately half of the infected individuals will be in the latent phase so won't test positive[42]; secondly, the programme would have to be run on a regular basis and relatively frequently if a sustained mitigation of the pandemic were to be achieved, posing a number of issues in terms of feasibility and cost-effectiveness[43] [44]. As shown by the Slovakian case, the immediate benefits can be quite substantial: the intervention resulted in a 60% decline in infection prevalence within one week (or 80% in two weeks), while primary schools and workplaces were mostly open, suggesting that such a rapid drop in numbers was linked to the mass testing campaign[45]. However, critics pointed out that the daily positivity rate for PCR tests 2-3 weeks after the intervention was roughly the same as it was before it, and questioned the possibility of further rounds that could exhaust the already stretched capacity of medical workers and cause a significant and unnecessary interruption to society[46].

Almost all the sources examined in this review mention the same benefits of asymptomatic testing, which can be summed up as:

- **Rapid detection of hidden cases**. Testing asymptomatic individuals serves the aim of identifying cases that would not otherwise have been detected in the absence of symptoms (current estimates indicate these to be about a third of

[37] COVID-19 testing in Slovakia (nih.gov)
[38] Elimination of COVID-19 in the Faroe Islands: Effectiveness of massive testing and intensive case and contact tracing. - The Lancet Regional Health – Europe
[39] Mass,testing,evaluation.pdf (liverpool.ac.uk)
[40] Evaluation of the Lateral Flow Device Testing Pilot for COVID-19 in Merthyr Tydfil and the lower Cynon Valley (cwmtafmorgannwg.wales)
[41] Communities and Testing for Covid-19 by Steven Stillman, Mirco Tonin :: SSRN
[42] Eurosurveillance | Impact of mass testing during an epidemic rebound of SARS-CoV-2: a modelling study using the example of France
[43] The Impact of Mass Antigen Testing for Covid-19 on the Prevalence of the Disease by Martin Kahanec, Lukas Laffers, Bernhard Schmidpeter :: SSRN
[44] Mass testing—An underexplored strategy for COVID-19 control - ScienceDirect
[45] The effectiveness of population-wide, rapid antigen test based screening in reducing SARS-CoV-2 infection prevalence in Slovakia | medRxiv
[46] COVID-19 testing in Slovakia (nih.gov)

infections[47]), or identifying them earlier than they otherwise would have been via PCR-based testing once symptomatic. As a result, transmission could be rapidly reduced and quicker easing of lockdown measures allowed. A number of studies have explored the benefits of asymptomatic testing, highlighting how strategies based on symptom screening could miss between 40%-100% of infected people depending on setting and disease prevalence[48].

LFD tests can provide near instantaneous results, hence facilitating the timely isolation of the most infectious cases who may otherwise transmit infection while waiting for a PCR result[49] [50]. Indeed, it can take up to 4-6 days to receive PCR test results, as the process requires several steps such as ordering the test, carrying it out, mailing it to the laboratory and waiting for the testing procedures to be carried out[51]. By increasing the frequency of repeat testing over short periods of time, LFD tests have the potential to detect a higher number of cases[52]. Furthermore, due to its high sensitivity, PCR testing tends to detect viral shedding long after the infectious period (a mean of 17 days), potentially affecting return to work or school[53] [54].

- **Participant wellbeing**. LFD home testing reduces access barriers to testing (for instance, for older people or those with mobility concerns) and health risks associated with venue-based testing due to viral exposure from/to others. Asymptomatic testing based on the 'test-to-enable' model allows participants to benefit from being able to continue working and from reduced chances of having to self-isolate. Finally, negative test results can provide reassurance.

  Qualitative research on a pilot programme implemented in Southampton using saliva samples collected at home shows that participants expressed a sense of relief and reduced feelings of anxiety when they tested negative. They felt that this enabled a "near normal" life to continue and were more confident going to school or work, or visiting vulnerable family and friends, knowing they were not spreading the virus[55].

[47] The Proportion of SARS-CoV-2 Infections That Are Asymptomatic : A Systematic Review - PubMed (nih.gov)
[48] JMIRx Med - Mass Testing With Contact Tracing Compared to Test and Trace for the Effective Suppression of COVID-19 in the United Kingdom: Systematic Review
[49] Science-Brief_Routine-Testing-in-LTC_20210323_published.pdf (covid19-sciencetable.ca)
[50] Shifting Coronavirus Disease 2019 Testing Policy and Research to Include the Full Translation Pipeline | Open Forum Infectious Diseases | Oxford Academic (oup.com)
[51] Rapid antigen screening of asymptomatic people as a public health tool to combat COVID-19 | CMAJ
[52] Shifting Coronavirus Disease 2019 Testing Policy and Research to Include the Full Translation Pipeline | Open Forum Infectious Diseases | Oxford Academic (oup.com)
[53] Put to the test: use of rapid testing technologies for covid-19 | The BMJ
[54] Scaling up COVID-19 rapid antigen tests: promises and challenges - ScienceDirect
[55] How best do we engage the general population in testing for COVID-19? | medRxiv

- **Time and cost savings**. Asymptomatic testing may be a cost-effective strategy. LFD test kits are relatively inexpensive, do not require laboratories and provide results rapidly. Their ability to provide near instantaneous results avoids the delays associated with PCR tests and facilitates the timely isolation of infectious cases by shortening the length of time between initial infection, test results, and preventive action[56]. Depending on the model of delivery, asymptomatic testing also has the potential to reduce unnecessary self-isolation when contact-traced, hence also reducing work absences and the costs of sick pay associated with them. Furthermore, it can reduce the strain on laboratories that must conduct PCR–based diagnostic testing and cut healthcare costs by reducing the need for trained providers[57]. Finally, it can positively impact on infections, mortality and hospitalizations. Modelling from the Slovakian case shows that, without the nationwide testing, the ICU bed occupancy could have almost doubled in the worst-case scenario[58].

The sources examined in this evidence review report some obstacles met by testing regimes that can impede their success. These are:

- **Reluctance in taking LFD and PCR tests**. Participants in a number of trials reported concerns regarding LFD and PCR tests, which they considered invasive and difficult to self-administer. Furthermore, swabbing younger children and people with disabilities has been seen as an emotional and physical challenge for which many felt unprepared[59].

  Saliva tests have been indicated as a preferable alternative. Qualitative evaluation of a Southampton-based pilot showed higher compliance when swab tests were replaced by saliva sampling. Making participation as convenient and easy as possible was key to increasing uptake, with parents reporting that the test was simple enough for children to take responsibility for carrying out the tests themselves[60]. Saliva tests are also a stable way of testing: the tube for the sample contains preservatives and additives that kill the virus while preserving its RNA. This means the sample doesn't retain infectious particles unlike a swab[61].

- **Failure to upload test results**. Testing participants might not upload their results or may upload them incorrectly. A pilot conducted in care homes in Liverpool identified a lack of void LFD tests recorded online. This suggests that

[56] Put to the test: use of rapid testing technologies for covid-19 | The BMJ
[57] Shifting Coronavirus Disease 2019 Testing Policy and Research to Include the Full Translation Pipeline | Open Forum Infectious Diseases | Oxford Academic (oup.com)
[58] Infectious Disease Reports | Free Full-Text | On Pilot Massive COVID-19 Testing by Antigen Tests in Europe. Case Study: Slovakia (mdpi.com)
[59] COVEDI2018-1.pdf (scot.nhs.uk)
[60] How best do we engage the general population in testing for COVID-19? | medRxiv
[61] Testing for COVID-19 - The Lancet Respiratory Medicine

void tests were not uploaded or incorrectly uploaded as negative results to the testing system[62]. This barrier raises questions about the validity of collected data and the risk of spreading the virus, especially if positive results are not uploaded. It also invites question about the reasons why people fail to upload their results and whether this happens more frequently with negative results.

- **Risk that positive LFD tests are not followed by PCR tests**. Testing participants might fail to take a PCR test following a positive LFD test for a number of reasons, ranging from lack of time to lack of faith in test reliability.
- **Failure to perform the test correctly.** Self-administering the test has the potential to reduce demand on trained personnel, transmission risk in the process of sample collection, reduce strain on laboratories performing PCR tests and guarantee increased access to frequent testing. However, these benefits need to be weighed against the potential loss of sensitivity. Self-testing requires skill, and swabs taken by untrained individuals are more likely to give false negative results.

  Although data from Germany suggests that self-administered tests have very similar sensitivities to those achieved by professionals, even when people deviated from the instructions[63], other studies show a different picture. When the UK Government implemented a pilot with LFDs to support mass population testing and to open care homes to visitors in November 2020, a drop in sensitivity was recorded: test sensitivity was 48.89% when self-administered, compared to 73% when carried out by trained healthcare workers[64]. This loss of sensitivity depending on the person performing the test had already been observed by Public Health England in its evaluation of the Innova test: a sensitivity of 79.2% when used by trained laboratory scientists, 73% when used by trained healthcare staff, but only 57.5% when used by Test and Trace centre staff employed by the pharmacy chain Boots[65]. Performance may improve with experience, as people become more familiar with tests over time.
- **Lack of knowledge and misconceptions about testing**. Some pilots report that individuals find it difficult to understand differences between the PCR and LFD tests, why a test is needed in the absence of symptoms, and how and

[62] Enhanced Lateral Flow Testing Strategies in Care Homes Are Associated with Poor Adherence and Were Insufficient to Prevent COVID-19 Outbreaks: Results from a Mixed Methods Implementation Study

[63] SARS-CoV-2 patient self-testing with an antigen-detecting rapid test: a head-to-head comparison with professional testing | medRxiv

[64] COVID-19 testing in English care homes and implications for staff and residents (nih.gov)

[65] Covid-19: How the UK is using lateral flow tests in the pandemic | The BMJ

where to get tested[66] [67] [68]. Qualitative research conducted among contacts of confirmed Covid-19 cases who were offered the option of daily testing highlighted how for some participants, doubts about the accuracy of LFD tests led them to prefer self-isolation. Participants, especially those living with a positive index case, were also concerned about the possibility of contracting or transmitting the virus within the 24 hour window between tests[69]. These concerns regarding asymptomatic testing often originated from media coverage and ongoing debates about their accuracy.

The use of LFDs has divided the medical and scientific community, between those who believe that the tests may miss so many infections that they could cause more harm than good, and those advising that using rapid antigen (LFD) tests frequently would make them effective at stemming the tide of a pandemic[70] [71]. Analysis using mathematical modelling suggested that a strategy using tests with lower sensitivity could be as effective as relying on more sensitive tests (PCR) used less frequently[72]. Lateral flow tests are more likely to detect positive cases when viral loads are highest and patients are most infectious, usually one to three days before the onset of symptoms and during the first five to seven days after their onset. This means that false negative results can arise in people tested before the viral antigen shed in the nose and throat is sufficient to be detected. It needs to be noted that despite a higher risk of false negative results, the rapid increase in viral shedding after the incubation period should leave only a short period when there will be a substantial difference between the point when you get a first positive result from a PCR test compared with a LFD[73]. As the window for using lateral flow tests to detect infectious cases is narrow, they are most suitable when testing is frequent[74] [75]. Informing the public that increasing the frequency of testing (for instance, to every 2–4 days) helps discover false negative cases (i.e. genuine positives) might improve testing uptake.

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[66] Behavioural barriers to COVID-19 testing in Australia: Two national surveys to identify barriers and estimate prevalence by health literacy level (medrxiv.org)
[67] MHP Understanding Covid Terminology – January 2021 « Savanta ComRes (comresglobal.com)
[68] Mass,testing,evaluation.pdf (liverpool.ac.uk)
[69] Engagement with daily testing instead of self-isolating in contacts of confirmed cases of SARS-CoV-2: A qualitative analysis | medRxiv
[70] Sorpresa-en-tests-rapido-para-coronavirus.-Nature.docx.pdf (acacimesfe.org)
[71] A model for COVID-19 with isolation, quarantine and testing as control measures - ScienceDirect
[72] Modeling Effectiveness of Testing Strategies to Prevent Coronavirus Disease 2019 (COVID-19) in Nursing Homes—United States, 2020 | Clinical Infectious Diseases | Oxford Academic (oup.com)
[73] Put to the test: use of rapid testing technologies for covid-19 | The BMJ
[74] Shifting Coronavirus Disease 2019 Testing Policy and Research to Include the Full Translation Pipeline | Open Forum Infectious Diseases | Oxford Academic (oup.com)
[75] Sorpresa-en-tests-rapido-para-coronavirus.-Nature.docx.pdf (acacimesfe.org)

- **Perception of being low risk**. For those who already perceive their risk as low, regardless of their objective risk, negative results could falsely reassure there is no risk of being infectious, reduce adherence to the guidelines, such as becoming less vigilant in applying social-distancing and hygiene measures, and increase the spread of Covid-19 as a result[76] [77] [78] [79]. In particular, perception of being low risk can apply to those who have received their vaccine or have had Covid-19 in the past.

  When the University of Illinois implemented a campaign in August 2020 aiming at screening everybody on campus twice a week with saliva tests, they modelled that students were going to go to parties and that they probably weren't going to wear masks, but what they didn't expect was that people would choose to go to a party even if they knew they were positive[80]. This suggests perception of being low risk in certain age groups, maybe driven by the awareness that younger people tend not to have such negative outcomes as older age groups from Covid-19. It could also be hypothesised that students perceive proximity to their peers as low risk, especially if they live in shared accommodation, and that social responsibility is less relevant to them while they are in a campus environment, hence explain the high prevalence of Covid-19 outbreaks in universities across the UK[81].

  Some research presents more positive data. A pilot study conducted in England on close contacts of index cases who were offered the option of daily testing found that only 13% of those who tested negative reported engaging in more high risk activity than prior to testing. Indeed, 58% reported having fewer risky contacts than they had before they were contact traced[82]. The qualitative part of the study highlighted how a considerable number of participants were still reluctant to leave their homes despite consenting to take daily tests, and restricted their behaviour more than they had prior to testing[83].

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[76] Covid-19: Controversial rapid test policy divides doctors and scientists | The BMJ
[77] The Infectious Diseases Society of America Guidelines on the Diagnosis of COVID-19: Molecular Diagnostic Testing. | Clin Infect Dis;2021 Jan 22. | MEDLINE (bvsalud.org)
[78] Science-Brief_Routine-Testing-in-LTC_20210323_published.pdf (covid19-sciencetable.ca)
[79] IJERPH | Free Full-Text | Students' Views towards Sars-Cov-2 Mass Asymptomatic Testing, Social Distancing and Self-Isolation in a University Setting during the COVID-19 Pandemic: A Qualitative Study | HTML (mdpi.com)
[80] 'We didn't model that people would go to a party if they tested positive' (nature.com)
[81] IJERPH | Free Full-Text | Students' Views towards Sars-Cov-2 Mass Asymptomatic Testing, Social Distancing and Self-Isolation in a University Setting during the COVID-19 Pandemic: A Qualitative Study | HTML (mdpi.com)
[82] Engagement with daily testing instead of self-isolating in contacts of confirmed cases of SARS-CoV-2 | medRxiv
[83] Engagement with daily testing instead of self-isolating in contacts of confirmed cases of SARS-CoV-2: A qualitative analysis | medRxiv

- **Language and digital access barriers**. Testing participants might find it hard to interpret information on testing due to both language and digital access barriers. These difficulties apply to the end-to-end journey, from ordering a test to the message containing the results[84]. This could account for the lower uptake rate for potential participants from BAME and other backgrounds in some of the pilots, and suggests a need to develop materials and campaigns addressing them[85] [86]. For instance, when contacts of index cases were offered LFD testing with release for 24 hours in England from December 2020 to January 2021, individuals of Asian ethnicity and residing in the two most deprived IMD deciles were more likely to decline the offer. Of those who participated in the programme, individuals from BAME groups were less likely to report a result[87].
- **Financial and psychological barriers to receiving a positive test**. People may have concerns at having to self-isolate, being unable to work, the impacts on their household life, and being stigmatised if they test positive. Students from a higher education institution in England who participated in a qualitative study expressed a sense of guilt if their household had to self-isolate because of them and feared the interpersonal conflict this situation could bring. Therefore, despite seeing testing as an important national strategy to manage the pandemic, they were not always willing to participate in the testing campaign[88].

  For residents within deprived areas, self-isolation tends to have a direct impact on remuneration and employment security. Furthermore, although financial and practical support is available, people are not always aware of it. People might be reluctant to participate in a testing campaign if they find that their private costs outweigh any social benefits from not infecting others. Qualitative research conducted in England on the 'test-to-enable' model showed that a small number of participants declined testing when they had concerns that a positive test could potentially extend the standard 10-day isolation period[89].

  It is noteworthy that 52% of participants in a research study on contacts of index cases offered the option of daily testing in England reported being more

[84] LFD Use Cases: Pilot Lessons Learned Capture. NHS Test and Trace (unpublished)

[85] Engagement with daily testing instead of self-isolating in contacts of confirmed cases of SARS-CoV-2 | medRxiv

[86] Mass,testing,evaluation.pdf (liverpool.ac.uk)

[87] The acceptability of testing contacts of confirmed COVID-19 cases using serial, self-administered lateral flow devices as an alternative to self-isolation | medRxiv

[88] IJERPH | Free Full-Text | Students' Views towards Sars-Cov-2 Mass Asymptomatic Testing, Social Distancing and Self-Isolation in a University Setting during the COVID-19 Pandemic: A Qualitative Study | HTML (mdpi.com)

[89] Engagement with daily testing instead of self-isolating in contacts of confirmed cases of SARS-CoV-2: A qualitative analysis | medRxiv

likely to share details of people that they had been in contact with following a positive test result, if they knew their contacts would be offered the same option[90]. This suggests potential higher compliance with the contact tracing programme and better case finding.

Many studies have also reported that individuals wilfully ignore medical diagnoses when they are torn between what they think they should do and what they want to do. Some might not want to know their health status regarding Covid-19[91].

Reluctance to get tested might have increased with media coverage on the unreliability of LFD tests[92]. Moreover, the risk of false-positive findings is not inconsequential, as they may lead to loss of work, needless isolation, separation from family members, and unnecessary psychological distress[93] [94] [95].

- **Lack of trust**. A lack of trust in government has been identified as one of the main reasons some choose not to take part in testing programmes. Government intentions about use of personal data have been identified as a cause of concern, especially in deprived areas, where social and economic inequalities often determine people's perceptions of the government and formal bodies[96].

  Researchers evaluating the pilot using saliva samples in Southampton reported that many of those who declined to take part in the testing regime were anxious about the risks associated with data transfer to NHS Test and Trace in the event of a positive test. On the other hand, the local NHS Foundation Trust was trusted, suggesting that local organisations would increase testing uptake if they run the programme[97]. Hence, maintaining trust in government is key to promoting participation in testing.

- **Test access**. Reluctance to get tested might also pertain to concerns about testing centre location, time lost taking the test and the logistics of home testing. The voluntary mass testing scheme implemented in the Italian region of South-Tyrol in November 2020 revealed how individuals were more likely to get

[90] Engagement with daily testing instead of self-isolating in contacts of confirmed cases of SARS-CoV-2 | medRxiv
[91] Testing for COVID-19: willful ignorance or selfless behavior? | Behavioural Public Policy | Cambridge Core
[92] Engagement with daily testing instead of self-isolating in contacts of confirmed cases of SARS-CoV-2: A qualitative analysis | medRxiv
[93] Challenges and Controversies to Testing for COVID-19 (nih.gov)
[94] Universal screening for SARS-CoV-2 infection: a rapid review - PubMed (nih.gov)
[95] Clinical and Economic Effects of Widespread Rapid Testing to Decrease SARS-CoV-2 Transmission | Annals of Internal Medicine (acpjournals.org)
[96] Mass,testing,evaluation.pdf (liverpool.ac.uk)
[97] How best do we engage the general population in testing for COVID-19? | medRxiv

tested in communities where there were more centres and access to them was convenient[98]. The evaluation of the asymptomatic testing pilot in Liverpool included a rapid thematic analysis of local narratives through local community media and social media and revealed that key barriers to participation were accessibility and concerns over queuing, sometimes despite advanced booking[99].

- **Inadequate training or excessive work burden**. A number of studies have reported how the testing programmes in the workplace have resulted in added responsibilities and increased workload for members of staff. Senior representatives of the organisations involved in the Southampton pilot on saliva testing suggested that a 'toolkit' of instructions and tips for those implementing the programme could have helped manage the expectations of both staff and participants[100]. The staff involved in a pilot for personnel and visitors of care homes implemented in Liverpool showed poor adherence to LFD testing protocols (the majority completed less than a third of the tests specified). A potential loss of knowledge through cascade training and test regimens complicating workflows of already over-burdened staff were identified as two main obstacles[101]. Research conducted in October 2020 in Germany in care homes noted how a regular testing regime might require substantial additional staffing and resources. The existing healthcare workers in the care homes examined were already too stretched to engage in further tasks, such as testing visitors. Furthermore, getting tested before the beginning of a shift meant that staff needed to start work 30 minutes early and be paid for the extra time[102].

Although testing has been recommended as a key public health strategy, several countries have reported the challenges posed in terms of the costs involved in sustained testing regimes[103]. Most of the studies examined in this review highlighted:

- **Costs of test kits**. LFD devices cost governments about £3.50 per unit (converted from 5 euros/dollars in the articles), making them an affordable

[98] Communities and Testing for Covid-19 by Steven Stillman, Mirco Tonin :: SSRN
[99] Rapid thematic analysis of community social and online media in response to mass asymptomatic COVID-19 testing in Liverpool, England
[100] How best do we engage the general population in testing for COVID-19? | medRxiv
[101] Enhanced Lateral Flow Testing Strategies in Care Homes Are Associated with Poor Adherence and Were Insufficient to Prevent COVID-19 Outbreaks: Results from a Mixed Methods Implementation Study
[102] Rapid COVID-19 testing in care homes in Germany: Easier said than done – Resources to support community and institutional Long-Term Care responses to COVID-19 (ltccovid.org)
[103] Recommendations for SARS-CoV-2/COVID-19 testing: a scoping review of current guidance | BMJ Open

alternative to PCR tests[104] [105]. However, some participants might find it difficult to do the test properly (for example, correctly following the requirement to test at the tonsil area without touching elsewhere). This means multiple swabs might be needed and unopened test kits wasted. The Under-Represented Groups Team (URGE) at NHS Test and Trace recommended the provision of a stock of swabs together with test kits to solve the issue[106].

- **Costs to run the model**. This includes the costs of setting up and administering the programme, including personnel training and equipment, and use of facilities and services. The Operation Moonshot for mass testing implemented in England is said to cost £100 billion and represent the equivalent of 77% of the NHS annual revenue budget[107]. Estimates of the cost-benefit ratio of testing programmes vary per country. In the US, one study estimated that the economic benefits of testing were about 30 times its cost[108], while another concluded that the increase in GDP resulting from the testing programme ranged from 2 to 8 times the incremental cost of the tests[109]. Analysis of asymptomatic testing conducted in Spain calculated a cost-benefit ratio of 7 to 19 in one study[110] and a social return of €1.20 on the investment of €1 in another[111]. For England, some more critical voices calculated (from estimates) in March 2021 that, if tests delivery costs £10-20 and only one test in 1500 comes back positive, that would amount to £15 000-£30 000 to detect one case, with the risk that it could be a false positive[112]. The evaluation of the Welsh pilot in Merthyr Tydfil and the lower Cynon Valley found the intervention cost effective, with a central estimate of £2292 per QALY (quality-adjusted life years) gained[113].
- **Time and human costs**. Regular asymptomatic testing has the potential to avert infections, hence reduce workdays lost due to sickness[114]. On the other hand, a false positive test could result in staff being removed from the workforce, unnecessary tests and possible isolation for colleagues linked to

[104] Sorpresa-en-tests-rapido-para-coronavirus.-Nature.docx.pdf (acacimesfe.org)
[105] Infectious Disease Reports | Free Full-Text | On Pilot Massive COVID-19 Testing by Antigen Tests in Europe. Case Study: Slovakia (mdpi.com)
[106] LFD Use Cases: Pilot Lessons Learned Capture. NHS Test and Trace (unpublished)
[107] Mass testing for covid-19 in the UK | The BMJ
[108] The COVID-19 Pandemic and the $16 Trillion Virus | Infectious Diseases | JAMA | JAMA Network
[109] Economic Benefits of COVID-19 Screening Tests with a Vaccine Rollout (medrxiv.org)
[110] The costs of COVID-19 and the cost-effectiveness of testing | Emerald Insight
[111] A Cost-Benefit Analysis of the COVID-19 Asymptomatic Mass Testing Strategy in the North Metropolitan Area of Barcelona[v1] | Preprints
[112] What do we know about lateral flow tests and mass testing in schools? | The BMJ (oclc.org)
[113] Evaluation of the Lateral Flow Device Testing Pilot for COVID-19 in Merthyr Tydfil and the lower Cynon Valley (cwmtafmorgannwg.wales)
[114] Clinical and Economic Effects of Widespread Rapid Testing to Decrease SARS-CoV-2 Transmission | Annals of Internal Medicine (acpjournals.org)

them. A study on routine asymptomatic testing of long-term care staff in Ontario suggests this could exacerbate staffing shortages and require further resources and time to manage suspected outbreaks: anecdotal reports reveal staff intention to leave or thoughts about exiting the sector due to the stress caused by regular testing, especially as staff members are not consistently paid for time to get tested[115]. This paper also reports that staff resources needed to operationalize the lateral flow testing strategy in long-term care facilities are much higher than what would be required with a PCR-based testing regime, with estimates of each home requiring an additional two full-time employees for this implementation[116].

The existing literature offers important reflections on attitudes towards and experiences of testing in relevant testing populations:

- **Willingness to participate was high.** Participants reported multiple reasons for wanting to take part in testing regimes. Some mentioned the desire to know whether they were infected, and a feeling of obligation to keep working and help tackle the virus[117] [118]. A rapid qualitative study conducted in Lothian showed how undergoing testing was often seen as a duty not only to loved ones, but to society as a whole. Joining a nationwide testing programme gave participants a sense of civic duty and of contributing to a collective pandemic response. Testing was also valued for providing personal reassurance and enabling social intimacy and freedom of movement[119]. A mixed methods study exploring the experiences and perceptions of mass testing of students at the University of Edinburgh reported that the decision to participate in the programme was motivated by trust in the university's guidance and/or the desire to know they were not infectious and could travel and mix with family safely[120].
- **Testing uptake and compliance with recording results are encouraging in some of the evaluation pilots.** Research from England reports that 51.1% of contact cases offered serial testing as an alternative to self-isolation accepted the offer, with high compliance with self-reporting LFD results[121] [122]. The pilot targeting the population in Merthyr Tydfil and the lower Cynon Valley recorded

[115] Science-Brief_Routine-Testing-in-LTC_20210323_published.pdf (covid19-sciencetable.ca)
[116] Science-Brief_Routine-Testing-in-LTC_20210323_published.pdf (covid19-sciencetable.ca)
[117] Mass,testing,evaluation.pdf (liverpool.ac.uk)
[118] How best do we engage the general population in testing for COVID-19? | medRxiv
[119] COVEDI2018-1.pdf (scot.nhs.uk)
[120] Student views and experiences of asymptomatic COVID-19 testing at the University of Edinburgh (diadev.eu)
[121] The acceptability of testing contacts of confirmed COVID-19 cases using serial, self-administered lateral flow devices as an alternative to self-isolation | medRxiv
[122] Frontiers | Engagement With Daily Testing Instead of Self-Isolating in Contacts of Confirmed Cases of SARS-CoV-2: A Qualitative Analysis | Public Health (frontiersin.org)

an uptake of 49 and 56% respectively in the two areas[123], while the Liverpool-based pilot reported a 57% uptake of testing[124]. During mass testing in the Italian region of South Tyrol, 69.7% voluntarily decided to get an LFD test[125]. **However barriers to uptake and engagement remain, as shown throughout this review.**

- **Personal experiences of testing are complex**. While testing is usually presented as a straightforward process in government documentation, personal experiences of testing report a number of challenges and issues: booking errors, a lack of slots in specific areas, and difficulties in reaching testing centres. Moreover, people seem to see testing as a process rather than a discrete technical event, entailing a significant burden of time, energy, and resources for the individual and their relatives/friends. This process includes different stages: weighing up information from multiple sources, interpreting ambiguities in testing criteria, navigating online bureaucratic systems, organising testing logistics, managing uncertainties around results, matching government guidelines to individual circumstances, and handling the repercussions of test results[126].

**Lessons learned**

This review aimed at gaining an understanding of what testing strategies have been implemented and the benefits and obstacles to success they have met. It has explored evaluation work and other relevant literature to assess the economic and societal potential and costs of testing regimes. Some of the lessons learned from previous and current experiences within the literature are:

- **Testing communications should be clear about the nature and benefits of testing**. It is key that everyone understands that asymptomatic cases can still spread the virus, and that the confusion around the need to continue testing after being vaccinated or having Covid-19 is addressed. Concerns about test accuracy should also be targeted, and more information on different kinds of tests, their reliability, and the rationale and importance of testing regularly provided. Data from the pilot programme on the use of saliva samples developed by the University of Southampton and Southampton City Council show how participants emphasised the need for open communication of the reasons they should register for the programme in order to promote transparency and trust, and help dispel myths, particularly about the accuracy of the tests. The pilot also implemented educational engagement activities

[123] Evaluation of the Lateral Flow Device Testing Pilot for COVID-19 in Merthyr Tydfil and the lower Cynon Valley (cwmtafmorgannwg.wales)
[124] Mass,testing,evaluation.pdf (liverpool.ac.uk)
[125] Communities and Testing for Covid-19 by Steven Stillman, Mirco Tonin :: SSRN
[126] COVEDI2018-1.pdf (scot.nhs.uk)

among students, whose increased knowledge appeared to make them more engaged with the programme and inclined to think they had more agency in controlling the spread of the virus and its damaging consequences[127].

Communication should also promote awareness of what test results mean, and particular attention given to negative results: a drop in adherence to behaviours that reduce transmission due to lowered risk perception could affect the overall effectiveness of testing programmes. Experimental research carried out in Germany showed that testing negative decreased the likelihood of exhibiting protective behaviours such as wearing a mask or keeping the required distance from others; however, receiving information about the validity of negative results reduced this tendency[128]. A study conducted in England also showed how intention to comply significantly increased when the behavioural implications of a negative test were communicated more explicitly[129]. Reiterating that a negative lateral flow result does not mean "not infectious" is essential[130]. It is also paramount to avoid conflicting messaging that may confuse the public. In some settings in England, people who received a negative result were told it was "great news", while in others that "you were not infectious when the test was done". There were also varying time periods suggested for continued testing: "regularly" in Lewisham, "once a week" in Bradford and "twice a week" in Havering[131]. In January 2021, a search of the websites of the 114 English local authorities rolling out lateral flow testing showed that the advice given to the public about a negative test result ranged from "Don't let a negative Covid-19 test give you a false sense of security" to "It is good news that you don't have the coronavirus"[132]. A mixed methods study exploring students' perceptions of testing at the University of Edinburgh reported how students had concerns about conflicting or unclear information on how to self-administer the test, as the guidance they were given differed between their first and second tests and the instructions they received from on-site staff differed from those received elsewhere[133].

- **Involving community leaders and stakeholder organisations in the development and implementation of testing programmes could help build trust, share goals, and bridge cultural and language gaps**. The UK Scientific Advisory Group for Emergencies (SAGE) has already emphasised

[127] How best do we engage the general population in testing for COVID-19? | medRxiv
[128] Unpacking the black box: Empirical evidence to understand the human factor for effective rapid testing against SARS-CoV2
[129] Reducing false reassurance following negative results from asymptomatic coronavirus (Covid-19) testing: an online experiment | medRxiv
[130] Put to the test: use of rapid testing technologies for covid-19 | The BMJ
[131] Covid-19: How the UK is using lateral flow tests in the pandemic | The BMJ
[132] Covid-19: People are not being warned about pitfalls of mass testing | The BMJ
[133] Student views and experiences of asymptomatic COVID-19 testing at the University of Edinburgh (diadev.eu)

the importance of high levels of engagement with communities and individuals for the successful outcomes of different testing strategies[134]. A rapid review of the role of community engagement in testing uptake in Southampton found that local community leaders and stakeholders had a fundamental role in determining behaviour change. Participants in the pilot perceived local organisations, such as schools and universities, as answerable to local people, hence more trustworthy than national, more 'faceless' organisations such as NHS Test and Trace. They suggested that receiving information from the University of Southampton and Southampton City Council about the rationale for, the design and the progress of the programme could help testing uptake[135]. Qualitative research conducted in the United States highlighted the importance of establishing trust within the community, understanding the issues impacting it and finding the most effective channels to promote testing[136].

- **Less invasive sampling techniques could increase uptake.** A test that is seen not only as reliable, but also quick and easy to administer has higher chances of being done. Willingness to participate in testing could be higher if less invasive sampling techniques (such as saliva sampling) are provided[137]. The use of less uncomfortable types of sampling methods may be an important factor for the success of testing programmes in clinical and community settings[138].
- **The context of use requires careful consideration**. The disconnect between the prescribed testing regime and the actual context of use should be addressed. A pilot in England showed how the requirements for care home employees or employers to get tested multiple times a week were not compatible with their working schedule. These testing regimes posed a high risk of increased staff dissatisfaction, and consequently staff turnover and burnout[139]. Similarly, qualitative research conducted with staff in English care homes reported a need for flexibility in a setting where swab-based testing can be organisationally complex and resource-intensive. Staff members often had to return to residents more than once to test at a time which was acceptable, and sometimes only those familiar with some residents managed to perform

134 TFMS: Behavioural paper supporting the consensus statement on mass testing, 27 August 2020 (publishing.service.gov.uk)
135 How best do we engage the general population in testing for COVID-19? | medRxiv
136 Qualitative review of promising practices for testing vulnerable populations at off-site COVID-19 testing centers - ScienceDirect
137 COVID-19 testing in English care homes and implications for staff and residents (nih.gov)
138 The Need for More and Better Testing for COVID-19 | Infectious Diseases | JAMA | JAMA Network
139 Enhanced Lateral Flow Testing Strategies in Care Homes Are Associated with Poor Adherence and Were Insufficient to Prevent COVID-19 Outbreaks: Results from a Mixed Methods Implementation Study

the test, such as in the case of people affected by dementia. This had a number of implications for staff time and wellbeing[140].

- **Equitable access to tests should be promoted.** In order to achieve equitable uptake, individuals who face additional barriers to testing, such as language barriers and/or digital exclusion, should be addressed by tailored campaigns. People should be reminded how to collect or book a test for delivery, and how to perform a test, by means of a range of media channels and formats. In low-literacy populations that might have trouble understanding written or graphic instruction materials, the use of online videos could be an option. On the other hand, as internet-based dissemination strategies may limit access for some segments of the population and require a proactive individual seeking information, it is paramount to explore other routes to communication as well. Recommendations have included promotion of LFD testing through commercial sites (for example, pharmacies and local shops), community-based organisations, and MTUs that could allow dissemination of both venue-based tests and self-test kits[141].
- **Psychological and behavioural consequences of test results may impact uptake**. Testing programmes rely on members of the public undertaking a substantial burden of responsibility across the testing stages. Willingness to participate can be affected by concerns about one's capability to self-administer a test, compliance fatigue, fear that positive test results may lead to stigma and worry that self-isolation will not be supported financially in the form of sick pay or other monetary payments. Research conducted in Southampton on testing uptake shows that participants were particularly worried about the personal consequences of a positive or false-positive result: they were concerned that if they had to isolate they would lose income, their employer would be unsympathetic and that a history of infection with the virus might affect their ability to get a mortgage and life-insurance[142]. This suggests a need for reassurance and that ensuring knowledge of the support available in Scotland is key in dealing with test outcomes. Using a language that acknowledges the challenges people face and emphasising the contributions of individual actions to a societal response may increases testing uptake[143].
- **Emphasising civic duty and the altruistic motivations of engaging in testing may be successful strategies to promote testing**. A communication strategy that focuses on protecting others and reducing the impact of the pandemic for society as a whole has already demonstrated its value in other

[140] COVID-19 testing in English care homes and implications for staff and residents (nih.gov)
[141] Shifting Coronavirus Disease 2019 Testing Policy and Research to Include the Full Translation Pipeline | Open Forum Infectious Diseases | Oxford Academic (oup.com)
[142] How best do we engage the general population in testing for COVID-19? | medRxiv
[143] COVEDI2018-1.pdf (scot.nhs.uk)

areas, such as vaccination and compliance with regulations[144]. Furthermore, believing that testing programmes specifically are contributing to tackling the pandemic and knowing that others are willing to participate may increase uptake[145]. Data from the Southampton pilot show how participants related their decisions to engage in the programme to pride in knowing that they were contributing to the national effort to manage the pandemic and viewed it as a privilege. Southampton University students reported being envied by those from other universities. Those accessing the programme through schools and GP surgeries (smaller and more cohesive organisations where, for example, staff and school pupils saw one another every day) said they frequently spoke about the programme and encouraged one another to take part[146]. The rapid thematic analysis of local narratives – part of the evaluation of the Liverpool-based pilot – revealed that the desire to protect the community and the belief that mass testing could help the city (and the country) return to normality were key drivers to getting tested[147].

- **Research on the underlying motivations that lead people to get a test when asymptomatic would aid the design of effective health communication and successful implementation of testing strategies.** Data from four cross-sectional surveys suggest that respondents got a test mainly to answer the question of whether they could be infected, demonstrating that testing wasn't used as a screening endeavour but rather as a reassurance after risky situations[148]. Exploring the reasons for use of testing could shed further light on how individuals in Scotland are using the testing pathways open to them (see Asymptomatic Testing Evaluation for more details on testing behaviours and motivations).

## Conclusions

This evidence review sets out an analysis of evaluation material provided by a variety of government sources and scholarly research on asymptomatic testing. It has examined 73 studies and reports of varying quality, which have provided an insight into models of delivery, benefits, barriers, costs and impacts of asymptomatic testing regimes. It has also presented some of the lessons learned

[144] Unpacking the black box: Empirical evidence to understand the human factor for effective rapid testing against SARS-CoV2, Cornelia Betsch et al., PsyArXiv Preprints, 13th April 2021
[145] Mass,testing,evaluation.pdf (liverpool.ac.uk)
[146] How best do we engage the general population in testing for COVID-19? | medRxiv
[147] Rapid thematic analysis of community social and online media in response to mass asymptomatic COVID-19 testing in Liverpool, England
[148] Unpacking the black box: Empirical evidence to understand the human factor for effective rapid testing against SARS-CoV2, Cornelia Betsch et al., PsyArXiv Preprints, 13th April 2021

through the implementation of testing programmes, both in the UK and in the rest of the world.

This analysis should be considered in the context of the rapidly changing area of the investigation, and in light of the lack of complete and/or robust evaluations on asymptomatic testing. The need for accurate empirical data on the effects that asymptomatic testing is having on case finding and reduction, on test numbers and positivity rates has been highlighted by articles and editorials [149] [150] [151].

[149] Mass screening for asymptomatic SARS-CoV-2 infection | The BMJ

[150] Covid-19: Government rolls out twice weekly rapid testing to all in England | The BMJ

[151] Covid-19: MHRA is concerned over use of rapid lateral flow devices for mass testing | The BMJ

**How to access background or source data**

The data collected for this social research publication:
☐ are available via an alternative route – see Public Health Scotland's published data on Covid statistics

☐ may be made available on request, subject to consideration of legal and ethical factors. Please contact socialresearch@gov.scot for further information.

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