UK Health Security Agency

NHS workforce repeat asymptomatic testing

Quantitative evaluation report

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This report is dedicated to the memory of Phil Wilson, a valued colleague and much-missed friend

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Executive summary

Context

The National Health Service (NHS) repeat asymptomatic testing programme was launched in early November 2020 in 209 trusts throughout England. A phased approach to testing was initiated with patient-facing staff prioritised in the first phase and managerial or back office staff in the later phase. Not all trusts were in a position to commence testing at the same time, and the programme ramped up over a period of weeks.

It should be noted that this testing programme was rolled out to the whole of the NHS, though this evaluation focuses on NHS trusts (that is, acute, community, ambulance, mental health and learning disability) and excludes primary care for reasons of timing of inclusion in the testing programme and route of reporting.

This is the report of the quantitative evaluation, delivered from available management information on reported tests. It intentionally does not address attitudes, motivations or behaviours of people and organisations participating in testing.

Evaluation was performed over 2 periods of testing. The first period was 27 weeks from 1 November 2020 to 9 May 2021. The evaluation was paused, and then resumed later in 2021 to cover a 19-week period from 10 May to 26 September 2021. By coincidence, and not design, the first period corresponded with the emergence and rise of the Alpha variant, and the second period with the emergence of and rise of the Delta variant.

Objective of the evaluation

The primary objective of the evaluation is to enable NHSE and NHS Test and Trace (DHSC) to understand the impact of repeat routine lateral flow testing of asymptomatic NHS staff on the detection of coronavirus (COVID-19) infection in the secondary care patient-facing NHS workforce that participated in this evaluation as part of a test, trace and isolate model.

(In addition to lateral flow testing, a smaller rollout of loop-mediated isothermal amplification (LAMP) testing of saliva was performed in some centres, a summary of which is included in Appendix 4.)

Testing intervention

Asymptomatic healthcare workers (HCWs) were tested with rapid antigen lateral flow devices. In the first testing period, LFD testing was twice-weekly self-testing at home using Innova devices provided in boxes of 25 by the employing trusts. Results were reported by HCWs to their

employing trust, and the trusts reported results weekly to NHS Test and Trace. By July 2021, NHS staff have been required to order lateral flow devices using the Universal Testing Offer, and are supplied with Innova, Acon FlowFlex or Orient Gene in boxes of 7. Some trusts have continued to collect and report results, while other trusts require their staff to report their results for themselves via the reporting page.

Asymptomatic testing with lateral flow (November 2020 to May 2021)

Overall testing numbers (November 2020 to May 2021)

Headline findings are that:

- 10.4 million tests have been reported between 1 November 2020 and 9 May 2021 across secondary care, community, ambulance, mental health and learning disability trusts in England
- 908,000 individual healthcare workers from participating secondary care NHS trusts reported at least one test – this represents 65% of the 1.3 million total workforce, bearing in mind that not all staff were eligible throughout the evaluation period
- 27% of HCWs reported between 11 to 25 tests over the 27-week evaluation period
- 37,300 of the 908,000 HCWs that registered a test, registered a positive result (4.1%)
- the median number of tests taken per person is 7 (5th centile = 1, 95th centile = 39)
- the void rate fell over time, from around 0.6% at the end of 2020, to under 0.15% by May 2021

Confirmatory PCRs (November 2020 to May 2021)

Headline findings are that:

- 53% of the positive LFD results were matched to a confirmatory PCR within 5 days
- there was 87% concordance between positive LFDs and matched confirmatory PCR results
- as expected, concordance dropped from 90% during periods of high prevalence in early January, to under 30% by May 2021, in line with the fall in prevalence
- the false positive rate has remained consistently low across the period, with an estimated LFD specificity of 99.95%

Take-up by demographics (November 2020 to May 2021)

The HCWs that reported the highest proportion of tests based on their representation within the NHS population were:

- over 65s (109%)
- females (68%)
- mixed ethnicity (75%)
- ambulance and community trust HCWs (88% and 87% respectively)
- highest positivity rates were reported in:
    - under 35s (1.0%)
    - males (0.8%, compared to 0.6% in females)
    - Asian/Asian British and black/black British (1.1%)
    - ambulance trust staff (1.3%)

Variant tracking (November 2020 to May 2021)

Positive confirmatory PCR test results which were positive for ORF1ab and N-gene but negative for S-gene and used this as a proxy for the Alpha variant. This data to identify how the proportion of positive confirmatory PCRs which were the Alpha variant changed over time. It was found that:

- the proportion of infections which were the Alpha variant rose from around 50% in mid-December 2020, to around 90% by the end of January 2021
- the Alpha variant already accounted for around 70% to 80% of infections in the South East, East and London regions by mid-December 2020
- by February 2021 that the Alpha variant accounted for over 90% of cases in HCWs in England

Vaccination status (November 2020 to May 2021)

The number of all LFD tests reported has declined at the same time as vaccination rates have increased, but a correlation cannot be made without further information.

Asymptomatic testing with lateral flow (May to September 2021)

Overall testing numbers (May to September 2021)

Headline findings are that:

- 5.3 million tests have been reported between 10 May 2021 and 26 September 2021 across secondary care, community, ambulance, mental health and learning disability trusts in England
- during this time period, it should be noted that some trusts asked their staff to report their tests via the GOV.UK reporting tool while others asked them to continue reporting directly to the trust; the split of this is unknown; the data used in this evaluation was taken from centrally reported data submitted by trusts. In addition, during this period there was a modest increase in the range of LAMP testing,

meaning that in some trusts, repeat asymptomatic testing was no longer conducted using lateral flow
- 447,000 individual HCWs from participating secondary care NHS trusts reported at least one test; this represents 34% of the 1.3 million total workforce, bearing in mind that not all staff would have been eligible throughout the evaluation period (there are a variety of reasons for this including annual leave, maternity leave, advice not to test within 90 days of a positive PCR and so on)
- 10,400 of the 447,000 HCWs that registered a test, registered a positive result (2.3%)

Confirmatory PCRs (May to September 2021)

Headline findings are that:

- 67% of the positive LFD results were matched to a confirmatory PCR within 5 days
- there was 78% concordance between positive LFDs and matched confirmatory PCR results

Testing uptake and positivity by trust type and NHS region (May to September 2021)

Headline findings are that:

- the HCWs that reported the highest proportion of tests based on their representation within the NHS population were those within community trusts (61%) and in the South East (51%)
- highest positivity rates were reported in ambulance trust staff (3.9%), North East and Yorkshire (NEY) (3.2%), and North West (3.2%)

Variant tracking (May to September 2021)

Headline findings are that:

- this period coincided with the rise of the Delta variant in the UK
- from sequencing of positive PCR samples, the Delta variant was first detected among HCW participating in this testing regime during the week commencing 12 April 2021, in London
- by the last week in May 2021, 90% of cases among HCW were Delta variant
- the rapid spread of Delta did not follow a discernible geographical pattern

Conclusions

It has been demonstrated that it is possible for HCWs in across secondary care, community, mental health and ambulance trusts to participate in repeat asymptomatic testing using lateral flow devices.

(Note: these conclusions should be interpreted in the context of the national testing programme at the time that the evaluation was conducted (spring, summer, autumn 2021). At that time the ability to launch and manage a mass testing programme of a given workforce was unproven, so demonstrating feasibility was important for the NHS and also more widely.)

At least 65% of the workforce on which this evaluation is focussed has engaged in testing at some level, and approximately 40,000 asymptomatic positive people were detected by lateral flow in the first 27-week period that saw some of the highest levels of SARS-CoV-2 prevalence in the community.

A further 10,400 asymptomatic people tested positive on lateral flow in a subsequent 19-week period which included another peak of prevalence in community infections predominantly with the Delta variant.

From the data on reported test results, it would appear that only a minority of HCWs who fall into this evaluated population are fully participating in the recommended regime of twice-weekly testing. However, we have no information on people who are testing but not reporting. It is worth noting that while the reasons for non-engagement are not clear, the figures in this evaluation relate to the proportion of the workforce who reported engaging with testing at some level, and the actual number of people testing is likely to be higher than this.

This evaluation presents an opportunity to analyse the efficacy of bilateral nasal swabbing, as this is the largest series of cases who provided samples in this way, as distinct from throat and nose swabbing, and for whom we have data on matched positive PCRs.

This evaluation was not able to explore participation in testing by different staff groups. This is likely to be of prime importance to trusts who need to be able to ensure that they can keep specific services staffed so that they can run safely, for example, theatres, ITU, A&E, district nursing, ambulance-based paramedics and so on.

The evaluation was conducted in real time during 2021, and it was possible to make practical service improvement recommendations which could be implemented, pertinent to testing requirements and reporting arrangements at the time.

Introduction

Context

At the start of November 2020, NHS England and Improvement (NHSEI) established a national programme of twice-weekly self-testing of asymptomatic patient-facing NHS healthcare workers (HCW) using SARS-CoV-2 antigen detection with INNOVA lateral flow devices (LFD). In this context, the term healthcare worker is used in the broadest sense and includes clinical and non-clinical staff. The programme was aimed initially at approximately 1.3 million staff working in NHS trusts and foundation trusts (hereafter 'trusts') covering 4 types of trust:

- acute general and acute specialist, hereafter 'acute'
- mental health, learning disability and combined mental health and learning disability, hereafter 'MHLD'
- community
- ambulance

In January 2021, LFD testing was extended to some non-frontline managerial and administrative staff and was also made available to approximately 0.4 million staff working across primary care. This included staff working in general medical and dental practice, optometry and pharmacy.

A different testing technology called Loop Mediated Isothermal Amplification (LAMP) had been previously piloted for repeat testing of asymptomatic HCWs in 5 acute NHS trusts from August 2020. LAMP testing continued in these trusts, with 2 more joining to make 7 trusts in total, running alongside LFD testing to complement NHSE's programme of repeat asymptomatic testing.

In February 2021, a protocol was presented to the Testing Initiatives Evaluation Board for a quantitative and a qualitative evaluation. This draft report presents the findings of the quantitative evaluation, using available management information on lateral flow testing in trusts. It should be noted that while repeat asymptomatic testing with Loop Mediated Amplification was originally in scope of this evaluation, we were asked to remove it by the Office of the Chief Scientist with the agreement of NHSEI. See Appendix 3 for a summary of LAMP performance to date among NHS HCWs.

There are a number of clarifications and limitations to note on this quantitive evaluation:

- includes all eligible HCWs in NHS trusts in England
- does not include primary care staff
- does not include independent sector staff involved in delivering NHS contracts
- protocol was designed to evaluate a policy that was implemented with great urgency
- protocol was designed nearly 4 months after the intervention was commenced

- real time evaluation of real world deployment of testing
- reporting period covered 27 weeks from 26 October 2020 to 9 May 2021
- no attempt at experimental design
- only reported test results are analysed; we have no knowledge of tests taken but not reported
- reliant on existing management information
- no bespoke data collected
- data accepted at face value
- does not address motivations, attitudes or behaviours of people or organisations participating in testing

Testing approach: push and pull models

The testing and reporting process for lateral flow testing is summarised below.

Method of test

November 2020 to July 2021

Boxes of 25 Innova test kits are distributed to staff for self-testing at home. These comprise swabs, buffer solution and lateral flow devices. Samples are obtained from swabbing to the mid-turbinate level in both nostrils.

(A pragmatic decision was taken by the NHS Test and Trace CMA's office to recommend nasal only swabbing, in the interests of encouraging better uptake by HCW. The approach was agreed by NHS England and the IFU was seen and acknowledged by MHRA.)

July 2021 onwards

In July 2021, once staff have used up their supply of Innova 25s, they are required to order kits for self-testing at home via the Universal Testing Offer. The following kits have been provided:

- 5 July to 18 July Innova 7s
- 19 July to 8 August Orient Gene
- 9 August onwards ACON FlowFlex

These comprise swabs, buffer solution and lateral flow devices. Samples are obtained according to the respective instruction for use (IFU) for each kit type. For Innova 7s this is swabbing to the mid-turbinate level in one nostril and bilateral tonsillar areas. For Orient Gene and Acon, this is swabbing to the mid-turbinate level in both nostrils.

Reporting of results

November 2020 to July 2021

HCW submit their results to their employing trust using the locally managed process. The trusts collate all results for weekly for submission to Public Health England (PHE). NHSEI advises that the locally managed process is highly variable.

July 2021 onwards

Some trusts require their staff to continue reporting locally, and results are aggregated by the employing trust and reported to NHS Test and Trace. Other trusts instruct their staff to report directly using the reporting tool on GOV.UK. The split between these is not readily available.

Procedure when a positive result is found

November 2020 to July 2021

The staff member is required to take a confirmatory PCR and self-isolate in accordance with government guidance. A positive confirmatory PCR test triggers tracing through NHS Test and Trace. Many trusts also conduct their own tracing among their workforce.

July 2021 onwards

As above, the staff member is required to take a confirmatory PCR and self-isolate in accordance with government guidance. A positive confirmatory PCR test triggers tracing through NHS Test and Trace. Many trusts also conduct their own tracing among their workforce.

Supporting documentation

November 2020 to July 2021

A single national standard operating procedure (SOP) and frequently asked questions (FAQs) for twice-weekly asymptomatic testing with LFDs are available on the NHSE website.

July 2021 onwards

As above, a single national standard operating procedure (SOP) and frequently asked questions (FAQs) for twice-weekly asymptomatic testing with LFDs are available on the NHSE website.

Participating organisations

This report examines the use of lateral flow testing in 137 acute trusts, 10 ambulance trusts, 17 community trusts and 45 mental health and learning disability trusts. Where trusts deliver both acute and community services, they have been classified for the purposes of this evaluation as acute.

Evaluation design

Evaluation objectives

The primary objective of the overall evaluation was to enable NHSE and NHS Test and Trace (DHSC) to understand the impact of repeat routine lateral flow testing of asymptomatic NHS staff on the detection of COVID-19 infection within the secondary care patient-facing NHS workforce that participated in this evaluation as part of a test, isolate and trace model. There were several secondary objectives, which are not in scope of this quantitative evaluation:

- to investigate staff experience of testing and elicit behavioural insights on uptake of testing and response to different types of result
- to measure cost/benefit to the NHS of undertaking testing
- to understand which testing approach may be most effective for detecting asymptomatic cases, and whether this is nuanced by staff groups, settings, and other factors

Evaluation questions

To support the initial design of the evaluation of repeat asymptomatic testing for NHS HCWs, a set of 19 questions was developed against the evaluation dimensions in the Test and Trace Evaluation Framework.

(The NHS Test and Trace evaluation framework was developed and refined in late 2020 to support evaluation design. NHS Repeat Asymptomatic Testing was commenced at about the same time that the framework was first proposed, and before it had yet been widely adopted.)

These questions are shown in Table 1, below.

Whist this report attempts to answer some of the evaluation questions, it is somewhat limited due to lack of experimental design. It should also be noted that the testing regime was commenced prior to the development of an evaluation protocol. This was due to the necessity to get as many NHS trusts in England regularly testing their staff in response to the rising number of SARS-CoV-2 cases. As such, we have compiled a report that summarises the data and converts it into useable management information.

Using this, we have been able to address questions 6, 7 and 9 and partially address questions 8, 10 and 11, considering the cut-off date for data input (see Table 1).

Table 1. Evaluation questions based on the 5 dimensions of the NHS Test and Trace evaluation framework

Evaluation dimension	Evaluation questions	Degree to which addressed in this evaluation
1. Operational feasibility	What resources are required to operationalise testing?	Not in scope of this evaluation
	How acceptable is the testing regime to those staff being tested?	
	What is the ongoing burden on trusts to manage and report?	
	What systems need to be in place to run a safe testing service?	
	Is there potential to use LFDs and/or LAMP to address outbreaks?	
2. Scientific knowledge	What is detection rate of asymptomatic positives with LFD?	Addressed in this report
	What is detection rate of asymptomatic positives with LAMP?	This is outside of the scope of this evaluation. A limited amount of data was obtained on LAMP testing which is included in Appendix 4.
	Is there a differential benefit between the testing approaches, and is there a benefit to integrating the approaches?	Given the limited data obtained regarding LAMP testing and focus on Lateral Flow Testing, this is not addressed in this report.
	Is the testing approach resilient to viral mutations?	Addressed in this report
	Can unexpected results profiles be explained? Do we add to our knowledge of sensitivity and specificity?	Partially addressed in this report – there is limited analysis of sensitivity possible from the available management information on lateral flow; we have provided commentary on specificity, on trends in positive results and on trends in void results.

Evaluation dimension	Evaluation questions	Degree to which addressed in this evaluation
	What is the impact of prior immunity or vaccination status on test performance?	Partially evaluated in this evaluation report – there is no data available on immunity and no person-level data on vaccination status, but we have provided analysis and commentary on uptake of vaccination among HCW during the period of the evaluation
	Does the testing approach find and contain infection? Is there a demonstrable impact on transmission?	Not addressed in this report – the available management information does not provide knowledge on containment.
3. Public health effectiveness	How equitable is the testing approach in terms of staff groups, roles and grade, and other demographic indicators such as age, ethnicity and so on?	Partially addressed in this report – management information allows analysis by age, gender, ethnicity, trust type, and NHS region, but there is no data on staff groups, roles or grade
4. Behavioural factors	Why do people agree or decline to be tested?	Not in scope of this evaluation
	How do people interpret and respond to a positive or negative test result?	
	What is staff experience of testing? Do people express a preference for one or other testing technology?	
5. Broader societal benefit	What is the impact of testing on workforce availability?	Not in scope of this evaluation
	Are there other identifiable benefits (or disbenefits) to individual staff and to trusts from participating in testing?	
	Do benefits of testing justify costs and effort?	

Methodology and data sources

Outline approach

We extracted data on reported test results from the centrally held NHS Test and Trace databases into which reported data was deposited. We analysed the data to look at participation in testing, as measured by numbers and trends of reported results. We were able to break this down by some specific demographic characteristics: age, gender, ethnicity, trust type and NHS region. We further analysed the data to look at test results and were able to apply the same demographic characteristics. We then focussed on positive and void results and, where possible for positive results, we linked to confirmatory PCR results to understand specificity, impact of changing prevalence, and features of known variants. Where possible and relevant, we compared our findings with published data on background SARS-CoV-2 prevalence and on vaccination status.

When reporting positive results, we refer to 'positivity' rather than prevalence or incidence which we do not attempt to estimate. Positivity can be defined in 3 ways in this report, and we have taken care to be clear how we are using the term:

- positive test results as a proportion of all test results over a given time period
- positive test results as a proportion of all people who took at least one test
- positive test results as a proportion of all people who were eligible to participate in testing

In order to calculate b) we needed to determine the number of individual people who reported test results.

Data quality and caveats

The evaluation period studied was 27 weeks from 26 October 2020 to 9 May 2021. This analysis is based on a cut of data taken on 16 May 2021 from DHSC's Environment for Data Gathering and Engineering database (EDGE). The second evaluation period studied was 19 weeks from 10 May 2021 to 26 September 2021. This analysis is based on a cut of data taken on 3 October 2021 from EDGE.

There are some points to note on data quality, accuracy and fidelity, and on our approach to data cleansing and categorisation.

Date of test

Approximately 4,000 results have been excluded from the evaluation on the basis of the recorded date of the test. The recorded test date was either before the testing programme commenced, or the test purported to have been taken after the date on which it was reported.

Number of unique HCWs

Pillar 2 test data on EDGE has a unique identifier for all individuals, which allows easy grouping. Due to the lower quality of the data collected on reported results from NHS HCWs, the Test and Trace EDGE team has not yet provided a similar individual identifier for the NHS data we use in this analysis.

(There was no single data collection approach, and this was left to individual trusts to make their own data submission arrangements, including deciding the data fields which they collected.)

We therefore took ‘First name’, ‘Surname’ and ‘Date of birth’ together to estimate how many distinct individuals had reported a test over the period, and to group multiple sequential tests carried out by the same person.

However, this approach is likely to over-estimate the number of distinct HCWs who have reported taking at least one test over the period as it is susceptible to counting people with misspelt names, or incorrect date of births as separate people. There will also be a potential to underestimate the number of distinct HCWs reporting a test due to people either having the same name and data of birth as another HCW, or from multiple people always leaving fields blank. It is for this reason that ‘First name’, ‘Surname’ and ‘Date of birth’ were chosen to group individuals as they looked to be the most completely and reliably completed fields.

Ethnicity

The ethnicity field is not completed for approximately one quarter of reported tests, so these are classified as ‘unknown’. Where an individual HCW has reported multiple tests, and the ethnicity field completed is not the same across all of those tests, we have used the ethnicity that appears most often for that individual.

Sex and/or gender

Sex and/or gender was a challenging characteristic to determine, not least because it wasn’t clear which of these was being asked for, and there was the facility to free text the answer. After cleansing the data, we ended up with 4 categories of gender:

- male
- female
- other (which included non-binary, trans, and ‘other specific’)
- unknown (where it either hadn’t been declared, or it had been stated as ‘prefer not to say’)

Matching to other data sources

We suspect that the true number of NHS staff taking a confirmatory test is greater than the number we were able to match, and that we are not able to link more cases due to the quality of

personal information in the NHS LFD data, and the lack of a unique identifier to link to the Pillar 2 data.

Lateral flow testing: data collection and management

LFD test results are reported weekly by NHS trusts, with the majority of data available on EDGE within 2 weeks. (It is the responsibility of individual HCWs to report their results to their employing trust, and for the trust to collate all results and upload them each week to the National Test and Trace system. We are only able to evaluate reported results. We can assume that not all results are reported by individuals to their trusts, and that it is likely there is a bias towards reporting positive results.)

Data was refreshed from EDGE on a weekly basis throughout this evaluation to capture results that were reported late. The final data refresh was 16 May 2020. Results are reported in the following categories:

- positive
- negative
- indeterminate
- void

The SOP asks for results to be reported as ‘positive’, ‘negative’ and ‘invalid’ but the original data collection spreadsheet used by PHE allowed for a third and fourth category of ‘indeterminate’ and ‘void’. It is not clear why this potential confusion arose with a fourth category when for the purposes of reporting, all other use cases are limited to 3. For the purposes of this evaluation, ‘indeterminate’ and ‘void’ were classified together as void, as there was no other way of knowing how to distinguish between them.

EDGE data contains many different personal information fields. These have allowed us to provide breakdowns by age, gender, and ethnicity of staff members.

We are able to examine ethnicity of people reporting tests in the following categories:

- white
- black, African, Caribbean or black British
- Asian or Asian British
- Chinese
- mixed
- other
- unknown or not declared

We used date of birth to group people by age into the following categories:

- under 25 years
- 25 to 34 years
- 35 to 44 years
- 45 to 54 years
- 55 to 64 years
- over 65 years

These categories for ethnicity and age were used to be in line with the figures from NHS Digital NHS workforce statistics. We have more limited information on gender, but are able to use the following categories:

- male
- female
- other (includes non-binary and trans)
- unknown (includes 'prefer not to say' and not declared)

We have also produced breakdowns by trust, region and trust type, as well as time series analyses. Data relating to occupation type, staff group and grade was not available.

Other data sources

To enhance this evaluation, further data was sought from a range of sources including:

- background national and regional prevalence from the ONS REACT-1 study
- SGSS and NPEX on EDGE for confirmatory PCR test results
- variant of concern data on EDGE
- total NHS workforce profile by ethnicity, age, gender published by NHS Digital
- LFD delivery allocation from NHSE

Evaluation: findings for period 1 (November 2020 to May 2021)

Number of tests reported and number of people reporting tests

This section covers the 27-week period from 1 November 2020 to 9 May 2021. The data is correct as at 16 May 2021.

Using 3 identifiers (first name, surname and date of birth) as a system of identification, we have estimated that approximately 908,000 HCWs reported at least one test result. The total workforce size across the trusts is 1.3 million, suggesting that 69% of HCWs reported at least one lateral flow test. It should be noted that not all trust staff were eligible to participate in testing and testing was not commenced in all trusts at the same time.

Over the 27-week period covered, 10.4 million tests were reported. Allowing for a ramp up in participation, and assuming that all trusts were fully engaged with the testing regime at the beginning of January 2021, on a twice weekly testing pattern the maximum number of test results that could be reported over the following 18-weeks would be 38 million.

(This is based on 80% of the NHS trusts workforce, 20% of workforce not on the frontline and not taking part in the testing regime. Furthermore, this makes the unrealistic assumption that all tests are negative, whereas if a positive result is found and confirmed on PCR, that individual would not expect to test again for the next 90 days.)

The total number of tests reported during this period is 8.2 million, which is 22% of the theoretical maximum.

The median number of tests reported per person over this 27-week period was 7 (range: min=1, 95th percentile = 39). Of HCWs who reported at least one test, 20% reported just a single test, while 14% reported more than 25. This resulted in a wide interquartile range of 2 to 17.

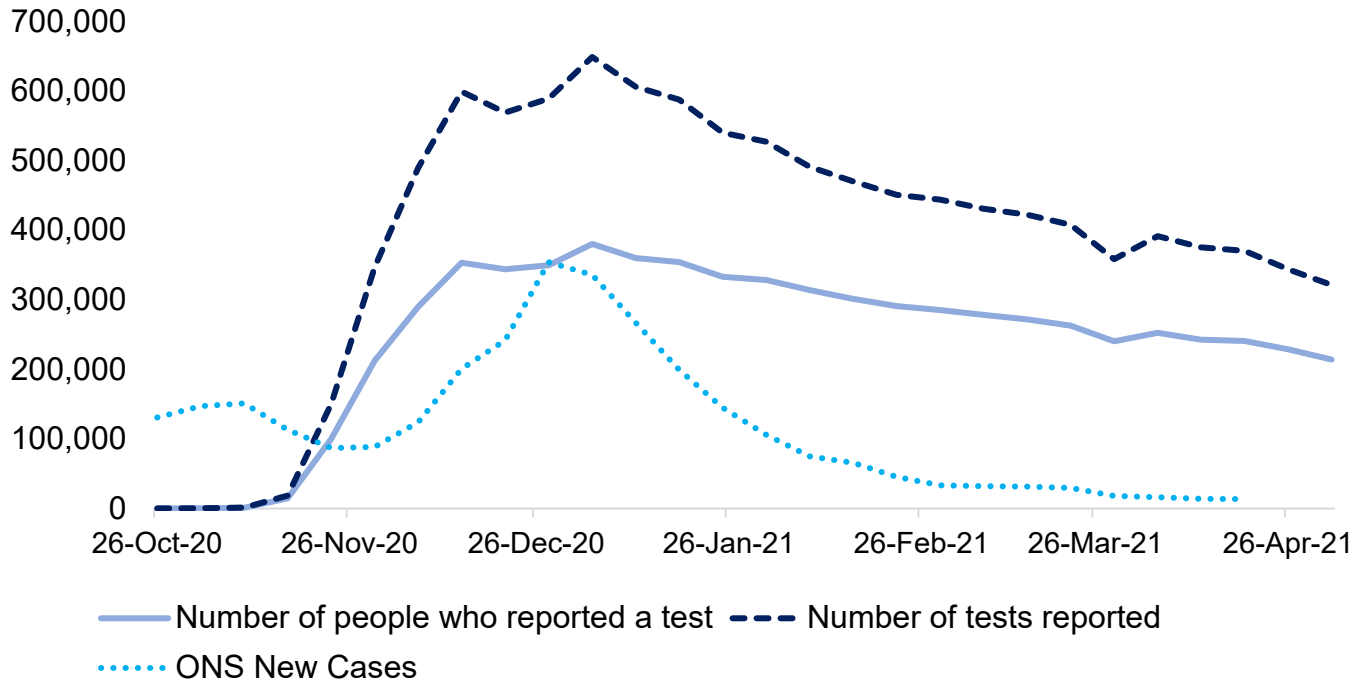
NHS trusts in England demographics were taken from NHS Digital and are summarised in Appendix 2 for reference.

Weekly analysis of reported test results

The numbers of tests reported increased over the first couple of months (from November 2020 to January 2021) as more trusts engaged with the testing regime, reaching a peak in early January when 680,000 tests were reported per week by 348,000 individual HCWs. The national lockdown on 4 January 2021 marked the start of a decline in the number of tests reported and is

in line with the decrease in prevalence of SARS-CoV-2 new cases within the English general population (Coronavirus statistics).

Figure 1. Weekly reported tests by HCWs in all English NHS trusts over the 27-week period



On examining the decline in test reporting, there are some discernible trends by age and ethnicity (see Table 2).

Table 2. Decline in test reporting by demographics between January 2021 and April 2021

Table 2a. Ethnicity

	Number of tests reported: January 2021	Number of tests reported: April 2021	Number of tests reported: difference (%)	Number of HCWs reporting at least one test: January 2021	Number of HCWs reporting at least one test: April 2021	Number of HCWs reporting at least one test: difference (%)
Asian	69,008	37,390	-46%	44,275	25,418	-43%
Black	62,960	35,733	-43%	39,609	23,892,	-40%
White	1,553,792	999,682	-36%	924,413	646,370	-30%
All other	74,844	44,771	-40%	46,612	29,498	-37%

Table 2a. Age band

	Number of tests reported: January 2021	Number of tests reported: April 2021	Number of tests reported: difference (%)	Number of HCWs reporting at least one test: January 2021	Number of HCWs reporting at least one test: April 2021	Number of HCWs reporting at least one test: difference (%)
Under 25	74,234	39,715	-47%	46,468	26,936	-42%
25 to 34	439,926	203,980	-54%	272,812	137,884	-49%
35 to 44	525,749	291,181	-45%	318,662	193,375	-39%
45 to 54	648,755	427,408	-34%	385,073	277,282	-28%
55 to 64	568,987	417,316	-27%	331,327	264,712	-20%
65 and over	95,163	79,025	-17%	54,913	48,932	-11%

There are notable drop-offs in the total number of tests reported by younger age groups and Asian and Black HCWs. Asian HCWs accounted for 5% of all tests reported in November 2020, but this fell to 3% by March 2021. Black HCWs also make up a smaller proportion of all reported tests, falling from 4% to 3%. However, these are changes in small numbers overall, and there is a more marked impact from the decline in testing in younger age groups where the data shows that among 25 to 34 year olds, testing rates halved from November 2020 to the end of March 2021.

We can postulate that these falls are connected to a combination of HCWs testing positive and therefore not needing to test for the following 90 days, and HCWs perceiving that once vaccinated, and with falling prevalence, testing (or reporting a test result) is no longer as important as previously. However, we do not have a sufficient understanding of the reasons for this decline in LFD testing or reporting.

Participation in testing

A total of 2,561,267 boxes of 25 tests have been allocated to NHS trusts across England. 1,227,309 of these were allocated by 15 January 2021, the remaining 1,283,958 were allocated by 4 March 2021.

To 9 May 2021, 10.45 million tests have been reported, which equates to 438,051 boxes of 25 tests.

Table 3 shows that 13.3% of HCWs who participated in the testing programme reported more than 25 tests, and that 0.3% of these reported more than 50 tests which, if performed twice weekly and with no positive results, would be fully consistent with the repeat asymptomatic testing regime over this 27-week time period.

Table 3. Number of HCWs who reported more than one test

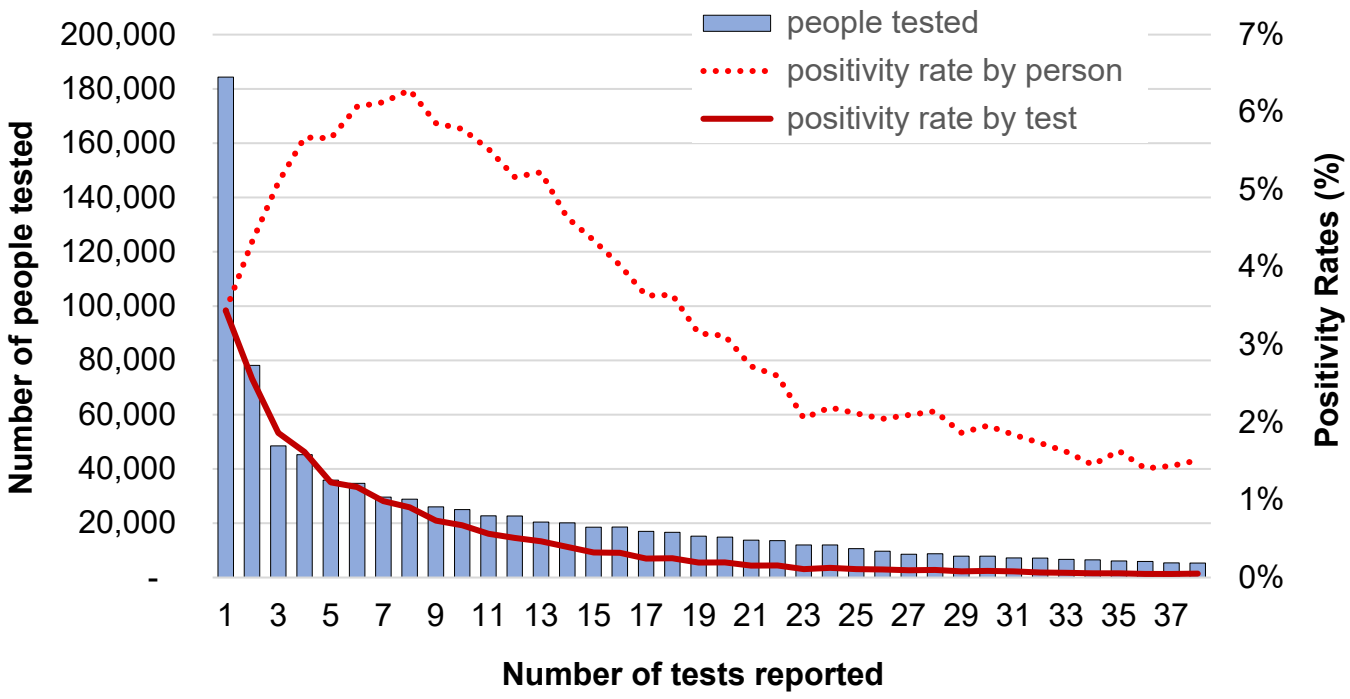
Number of tests reported	Total number of tests	Number of HCWs	% of all HCWs reporting
1	184,345	184,300	20%
2 to 5	662,266	207,800	23%
6 to 10	1,130,832	144,200	16%
11 to 25	4,237,967	248,800	27%
26 to 50	4,090,588	121,000	13%
Over 50	141,900	2,300	0.3%
Total	10,447,898	908,500	100%

We also looked to see how the positivity rate changed with the number of tests any given individual HCW reported over the period (see Figure 2). The positivity rate for individual tests is

highest (3.5%) for a test taken by someone who only reported one test over the period; this could be an indication that a number of individuals only report positive results, or that once individuals have received a positive result they no longer participated in the testing programme. The more tests an individual HCW took over the period the less likely any of those individual tests was positive. We might expect this to some extent, as people are instructed by the SOP to stop taking LFD tests for 90 days after they get a positive result. There also could be behavioural factors influencing this.

When we look at the positivity rate by person, we found people who took between 5 and 10 tests were most likely to be positive at some point over the period, with 6% of them reporting a positive LFD test result at some point.

Figure 2. Number of people who reported more than one test and the corresponding positivity rate



Numbers of tests reported by trust types and NHS regions

Regions

The number of tests reported as a proportion of kits allocated did not vary greatly between regions, with all trusts reporting between 12 and 16% of tests allocated.

Table 4. Percentage of allocated tests reported by NHS region

Region	Number of tests allocated	Number of tests reported	% of tests reported
London	9,653,050	1,302,105	13%
South West	7,016,550	1,099,309	16%

Region	Number of tests allocated	Number of tests reported	% of tests reported
Midland	11,691,075	1,913,174	16%
North West	8,134,400	1,324,042	16%
East	6,330,125	1,040,214	16%
N	10,012,075	1,839,097	18%
South East	9,944,400	1,929,957	19%
Total	**62,781,675**	**10,447,898**	**17%**

We do not have information on demand for kits which might be available from re-ordering metrics. This could be an interesting way to analyse what the trusts think they needed during the course of the evaluation period. The analysis summary of tests reported by each region is given in Table 5.

Table 5. Summary of tests reported by NHS region including the median number of tests taken by HCWs in that region who reported a test

Regions	NHS staff head count	% of NHS population	% of total tests reported	HCWs who reported at least one test %	Median	Lower quartile	Upper quartile
East of England	124,170	9%	14%	77%	6	2	17
London	216,350	16%	12%	64%	5	2	14
Midlands	247,630	19%	14%	66%	8	2	18
North East and Yorkshire	221,110	17%	15%	61%	10	3	21
North West	201,450	15%	14%	63%	5	1	16
South East	179,000	14%	16%	88%	9	3	19
South West	129,840	10%	13%	72%	8	2	18

The Midlands were most underrepresented in number of tests reported based on their staff head count, reporting only 14% of all test results despite making up 19% of the workforce population. East of England were most overrepresented in number of tests reported based on staff head count, having reported 14% of all tests whilst making up only 9% of the NHS workforce.

HCWs in the South East were most engaged with the testing programme with 88% of their workforce reporting at least one test result, whilst the North East and Yorkshire were the least engaged. Despite only 61% HCWs in NEY reporting a test result those who engaged in testing reported results more frequently with a median number of 10 tests reported.

Trust types

The analysis of tests reported by each trust type is shown in Table 6 below.

Table 6. Summary of tests reported by HCWS by trust type, including the median number of tests taken by HCW in that trust that reported a test

Trust type	NHS staffhead count	% of NHS population	% of all tests taken	% of staff who reported at least one test	Median number reported	Lower quartile	Upper quartile
Acute	973,280	75%	73%	70%	7	2	17
Ambulance	50,090	4%	4%	88%	6	2	15
Community	51,790	4%	6%	87%	10	3	22
MHLD	226,400	17%	17%	59%	10	3	21

The proportion of tests reported by each type is mostly in keeping with the proportion of staff in each trust type.

Analysis of tests reported by demographic characteristics

To establish differences in reporting across demographics, the proportion of tests reported by NHS staff was compared to proportion of staff by age, ethnicity and gender from NHS Workforce Statistics (December 2020) for secondary care.

The tests reported without the mention of age, gender or ethnic group were not included in the analysis. Please refer to Appendix 1 and Appendix 2 for more details.

Age group

The analysis of test reporting by each age band is shown in Table 7.

Table 7. Percentage of each age group of HCWs that reported at least one test result reporting

Age group	NHS head count	% of NHS population	% of total tests reported	% of staff who reported at least one test	Median	Lower quartile	Upper quartile
Under 25	71,340	5%	5%	57%	5	2	11
25 to 34	320,070	25%	23%	61%	6	2	14
35 to 44	303,810	23%	23%	64%	8	2	17
45 to 54	339,140	26%	25%	64%	10	3	21
55 to 64	236,620	18%	21%	76%	11	3	23
65 and over	29,590	2%	4%	100%	10	2	23

The over 65s account for 2% of the NHS workforce, but 4% of all tests reported, whilst 25 to 34 year olds account for 25% of the workforce but 21% of all tests reported. The median number of

tests increased with age and people over 45 years reported a median of 10 to 11 tests compared to a median of 5 to 6 tests in people under 34 years.

Ethnicity

Asian HCWs make up 11% of the NHS workforce but account for 5% of all tests reported. Black HCWs make up 7% of the NHS workforce but reported 4% of all test results. 26% of those who identified as Asian, and 37% of Black registered at least one result.

Table 8. Percentage of each ethnic population of HCWs that reported at least one test result

Ethnic group	NHS head count	% of NHS staff population	% of total tests reported	% of staff who reported at least one test	Media	Lower quartile	Upper quartile
White	966,090	77%	66.50%	60.60%	9	2	14
Asian	132,100	11%	2.80%	3.80%	5	2	12
Black	79,710	7%	2.50%	3.20%	5	2	14
Chinese	6,970	1%	0.40%	0.40%	7	2	17
Mixed	23,000	2%	1.60%	1.90%	6	2	20
Other	33,633	3%	3.10%	3.40%	7	2	16
Unknown			23%	26.70%	6	2	15

Gender

The proportion of tests reported by gender are broadly in line with the workforce representation as can be seen in the data summary table below.

Table 9. Summary of reported results by gender

Gender	NHS staff headcount	% of NHS staff population	% of total tests reported	% of staff who reported at least one test	Median number of tests taken	Lower quartile	Upper quartile
Female	999,790	77%	80%	68%	8	2	19
Male	300,790	23%	20%	58%	7	2	17
Unknown			6%		3	1	7
Other			<1%		15	6	28

Female staff reported slightly more tests, proportionally, than males.

LFD positivity rates

A note on definition of ‘positivity’

‘Positivity’ is a potentially ambiguous term in the context of this report. It generally is used to mean the number of positive tests among all the test results reported. However, at times, the denominator may be different. In this section, we have also reflected positive results in the following ways:

- as a proportion of the number people taking part in testing
- as a proportion of people who were eligible to take part in testing, whether or not they actually did

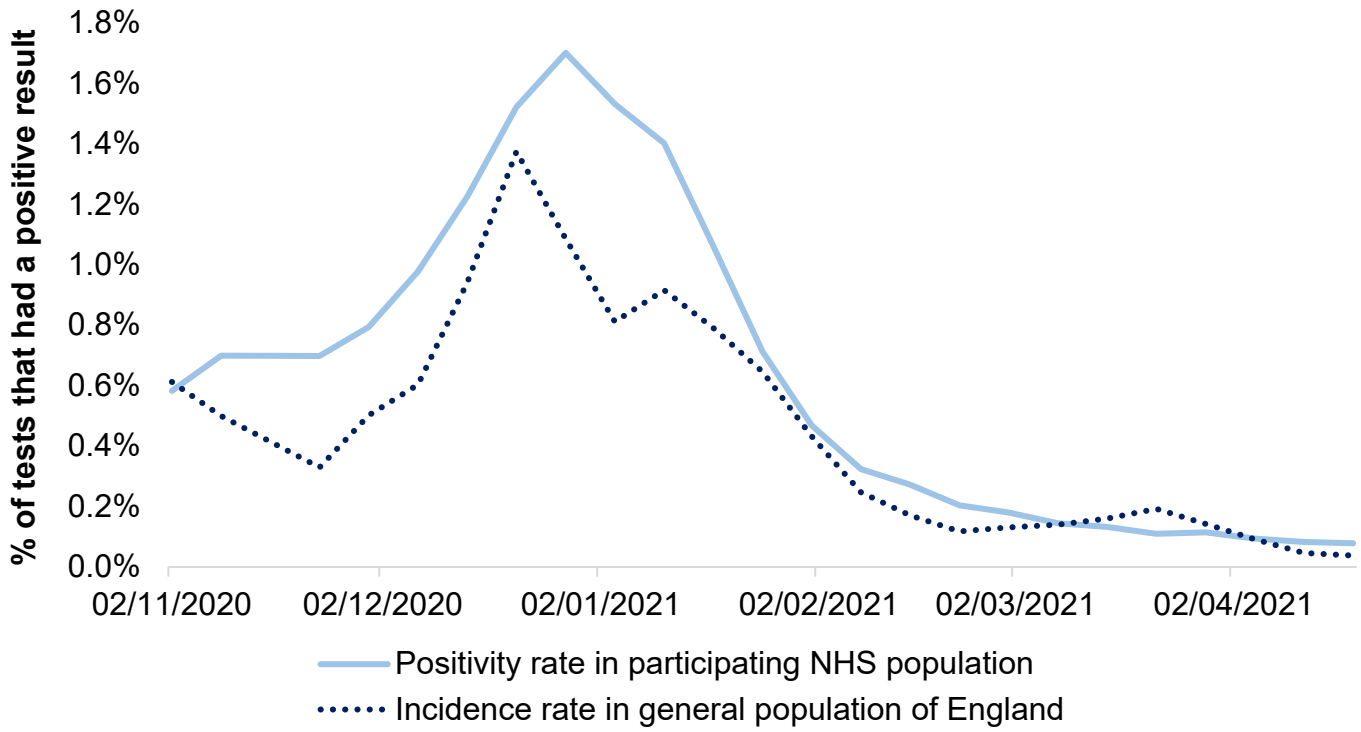
These 2 other uses of the term ‘positivity’ are helpful when looking at demographic characteristics of the testing population. For each set of analyses below, we have stated how we have defined positivity. It should be noted that we do not attempt to estimate incidence or prevalence of COVID-19 in the NHS workforce.

The positivity per week in reported tests reached a maximum of 1.7% at the peak in early January 2021. As the National Lockdown took effect in January 2021, positivity declined in line with the decrease in incidence rate as reported by ONS.

(ONS defines incidence as each new positive case representing an infection starting at the mid-point between the day of the test and the previous negative swab or at the 7 days before the day of the test, whichever was the closest to the first positive test.)

The number of positive results as a proportion of the people taking part in testing remained below 0.2% since the week beginning 22 February 2021 until April 2021.

Figure 3. Comparison of weekly trend in positivity rate HCWs and ONS estimation of % of English population testing positive (November 2020 to May 2021)



It is important to note that although the methods and definitions of the ONS study are different from positivity rates defined in our analysis, it is reasonable to look at positivity rate among HCWs against the context of ONS incidence estimations.

Additionally, to understand the impact of repeat testing on identifying asymptomatic cases, we compared the positivity rates in the reporting population with the REACT-1 study prevalence rates, noting that these are derived from PCR testing.

(REACT-1 provides period prevalence where a prevalent case is identified only once whereas, ONS weekly positivity rates identifies a positive case multiple time. Therefore, for an estimate of asymptomatic case proportions, we compared with REACT-1 study rates only.)

Weekly positivity rates from this evaluation period were matched to REACT-1 rounds 7 to 11 for better comparison (see Figure 3).

REACT-1 general population prevalence and the asymptomatic case prevalence were calculated to identify the proportion of asymptomatic cases in the general population. LFD testing detected 59% of the expected cases as estimated from the REACT-1 study (see Table 9). Although, REACT-1 provided prevalence by employment type, it did not provide the proportion of cases that were asymptomatic. Therefore, for this analysis, we compared general population asymptomatic case proportions with LFD test positivity rates.

Table 10. Estimated SARS-CoV-2 cases in HCWs captured with asymptomatic repeat testing, using REACT-1 as a proxy for prevalence

	Overall	November 2020	January 2021	February 2021	March 2021	April 2021
Prevalent cases in HCWs (REACT)	57,000	57,000	17,710	8,410	3,030	960
LFD positive cases in NHS	33,650	33,650	9,600	4,560	1,680	1,060
Proportion of cases detected via LFD tests	59%	54%	62%	54%	55%	110%

It is important to note that:

1. The REACT-1 study identifies prevalent cases (both symptomatic and asymptomatic cases) with PCR swab tests, not LFD.
2. The proportion of positive cases detected through LFD tests in healthcare workers was more than 100% in April 2021. With smaller number of cases there is greater uncertainty around the estimates, and in times of lower prevalence the proportion of false positives rises, but we have not made an allowance for this when applying the REACT-1 estimation.

Positivity rates of reported results by regions and trust types

The highest weekly positivity rates within the reporting population observed during the evaluation period were in the East of England (11.4%), London (8.4%) and the South West (8.3%). It is possible that rates were elevated in the London and the East of England due to the emergence of the Alpha variant in those regions during November and December 2020. In November 2020, it was noticed by PHE that the number of cases of COVID-19 in parts of London, Kent and Essex was increasing despite a National lockdown being in place.

(See SARS-CoV-2 variants of concern and variants under investigation in England, technical briefing 11.)

Weekly positivity rates among HCWs who reported their results were the lowest in the Midlands (4.2%) and the North West (4.5%).

Table 11. Positivity rates for HCWs that reported a test by NHS region, including weekly maximum, median and the overall (cumulative) positivity rate for the 27-week period

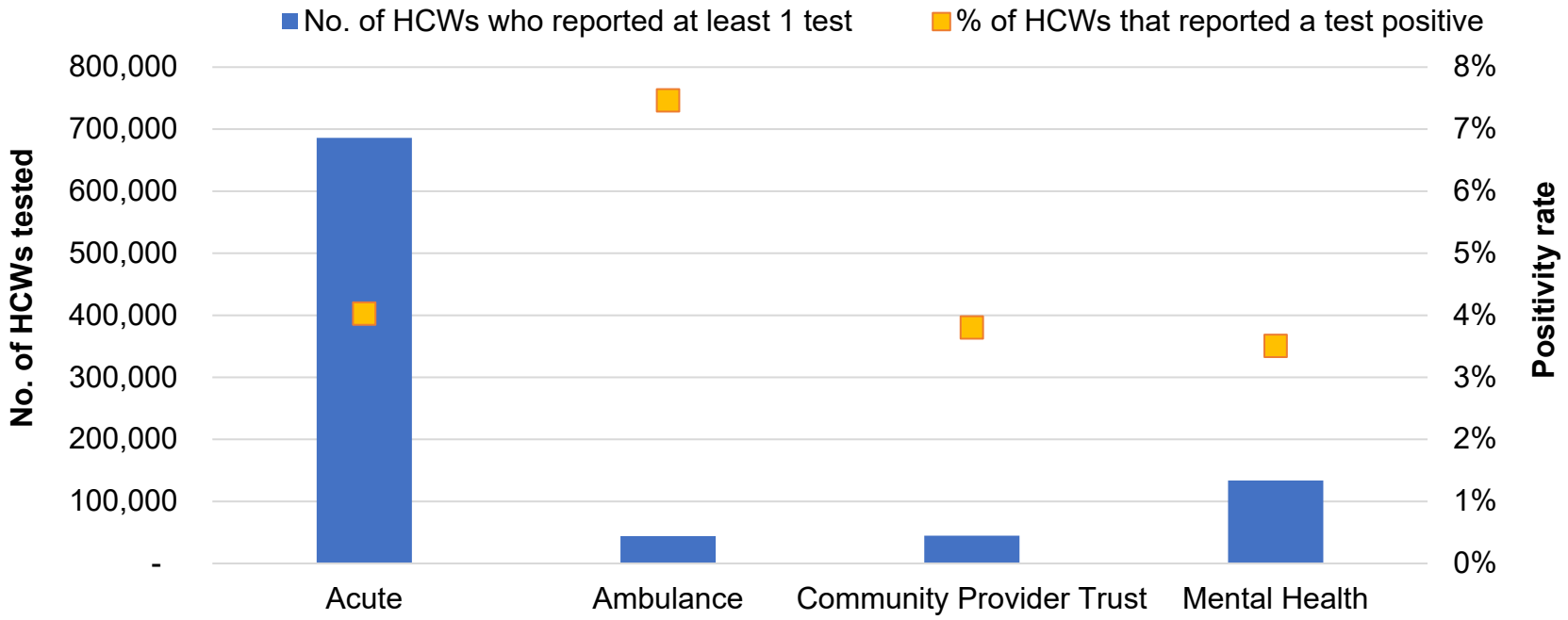
Regions	NHS head count	Number that reported at least one test	Number of positive results reported	Weekly positivity rate (%) of HCWs that reported a test: maximum	Weekly positivity rate (%) of HCWs that reported a test: median	Over 27 weeks
East of England	124,170	95,406	4,008	0.20%	0.07%	4.20%
London	216,350	138,513	7,220	0.20%	0.09%	3.80%
Midlands	247,630	163,000	7,130	0.30%	0.05%	3.20%
North East and Yorkshire	221,110	135,607	4,848	0.20%	0.03%	3.60%
North West	201,450	126,266	4,606	0.30%	0.05%	3.60%
South East	179,000	156,775	5,956	0.10%	0.07%	3.80%
South West	129,840	92,889	3,520	0.20%	0.17%	3.80%

Of HCWs who report their results, the highest weekly positivity rate was found to be amongst ambulance trusts, where 3.0% of results reported were positive. This high number may be explained by the nature of the work undertaken and the conditions in which ambulance staff work. However, it should be noted that ambulance HCWs reporting their tests are unlikely to all be frontline clinicians. Some will be working in ops rooms assigning calls to first responders. Without further investigation it is not possible to draw conclusions that staff working in ambulance trusts are at higher risk of COVID-19.

Table 12. Positivity rates for HCWs that reported a test by trust type, including weekly maximum, median and the overall (cumulative) positivity rate for the 27-week period

Trust type	NHS head count	Number that reported at least one test	Number of positive tests reported by HCWs	Weekly positivity rate(%) of HCWs that reported a test: maximum	Weekly positivity rate(%) of HCWs that reported a test: median	Positivity rate of HCWs that reported a test over 27 weeks
Acute	973,280	685,930	27,615	1.45%	0.04	4.00%
Ambulance	50,090	43,927	3,279	3.02%	0.08	7.50%
Community	51,790	44,837	1705	1.37%	0.05	3.80%
MHLD	226,400	133,762	4,689	1.29%	0.03	3.50%

Figure 4. Positivity rate of staff within NHS trust types that reported a test



Characteristics of staff that reported a positive test result

Table 13. Positivity rates for HCWs that reported a test by demographics including weekly maximum, median and the overall positivity rate for the 27-week period

Table 13a. Ethnicity

Demographic group	NHS staff head count	Number staff reported at least one result	Number of staff reported positive	Positivity rate: weekly reported maximum	Positivity rate: weekly reported median	Positivity rate over the 27 week period
White	966,090	550,491	21,990	1.30%	0.27%	4.00%
Asian	132,100	34,385	1,858	2.60%	0.27%	5.40%
Black	79,710	29,338	1,567	2.50%	0.27%	5.30%
Chinese	6,970	3,959	151	1.60%	0.28%	3.80%
Mixed	23,000	17,307	818	2.20%	0.27%	4.70%
Other	33,633	30,568	1,632	2.10%	0.27%	5.30%

Table 13b. Age group

Demographic group	NHS staff head count	Number staff reported at least one result	Number of staff reported positive	Positivity rate: weekly reported maximum	Positivity rate: weekly reported median	Positivity rate over the 27 week period
Under 25	71,340	40,949	1,878	2.60%	0.29%	4.60%
25 to 34	320,070	193,946	10,539	2.00%	0.32%	5.40%
35 to 44	303,810	194,547	8,962	1.60%	0.30%	4.60%
45 to 54	339,140	217,079	8,392	1.30%	0.29%	3.90%
55 to 64	236,620	179,036	5,881	1.00%	0.31%	3.30%
65 and over	29,590	32,339	868	1.00%	0.28%	2.70%

Table 13c. Gender

Demographic group	NHS staff head count	Number staff reported at least one result	Number of staff reported positive	Positivity rate: weekly reported maximum	Positivity rate: weekly reported median	Positivity rate over the 27 week period
Male	300,785	174,269	8,104	1.70%	0.18%	4.70%
Female	999,785	681,304	28,001	1.30%	0.17%	4.10%
Other		52,833	1,182	4.30%	<0.01%	2.00%
Unknown		50	1	1.60%	0.23%	2.20%

The highest weekly positivity rates (that is, percentage of test results that were positive) were observed in Asian and Black ethnicities (2.6% and 2.5% respectively), under 25 year olds (2.6%) and males (1.7%).

Figure 5. Weekly positivity rates of HCWs that reported a test by demographics and trust type

Figure 5a

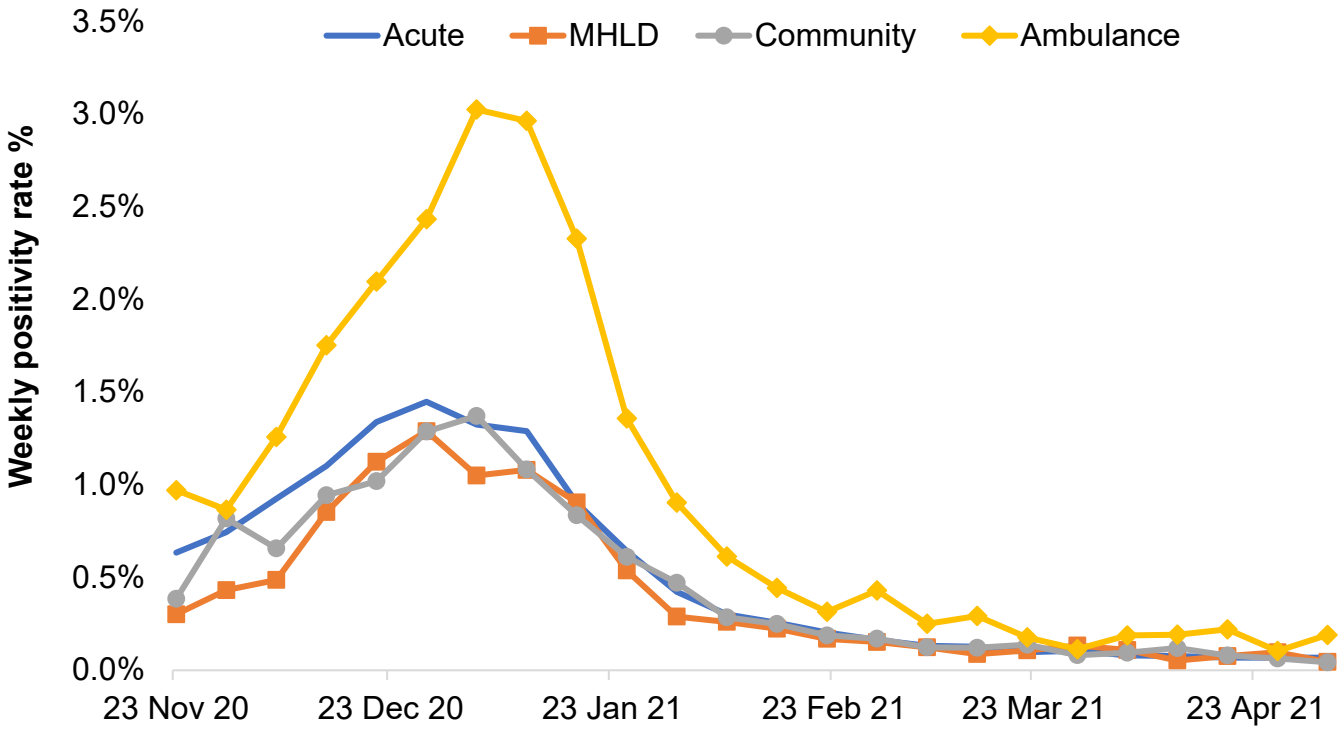


Figure 5b

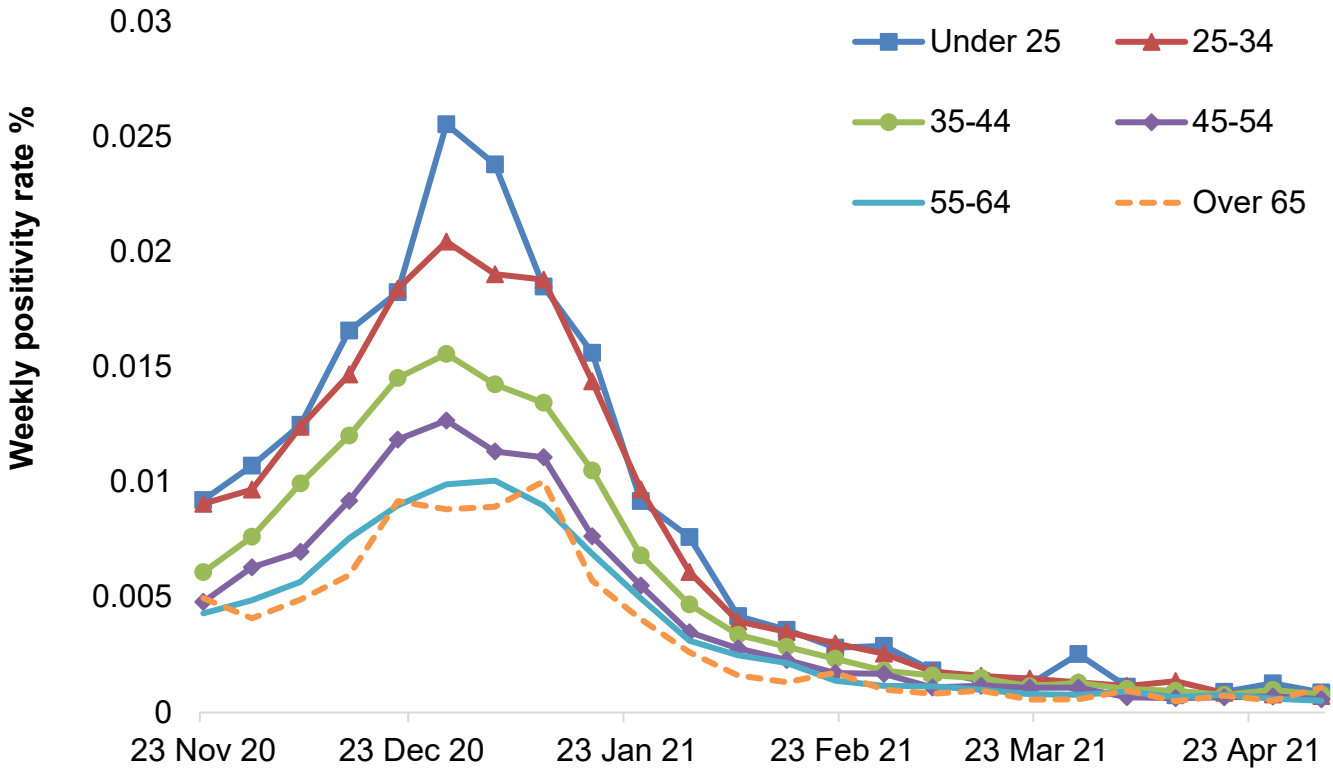


Figure 5c

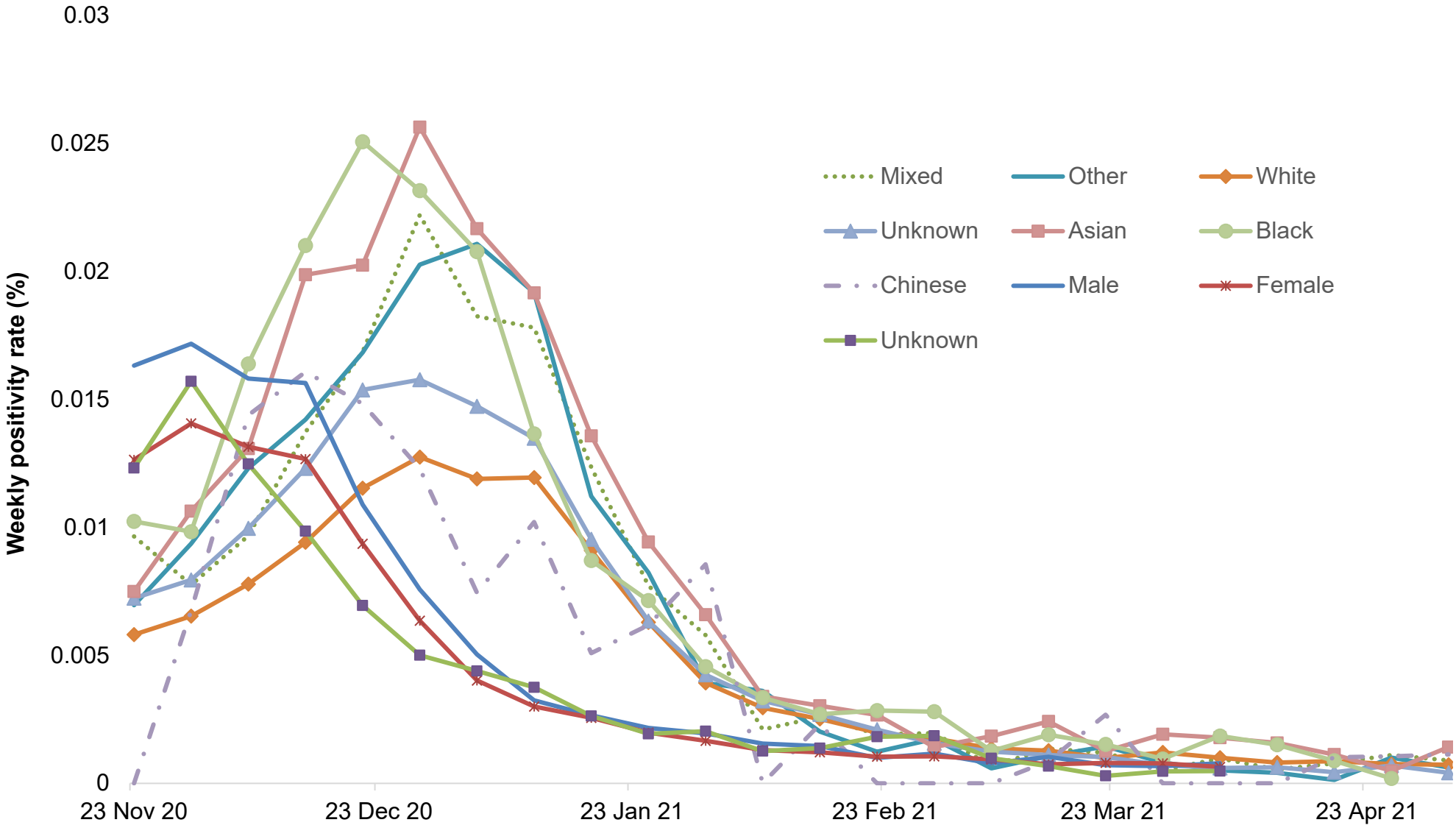
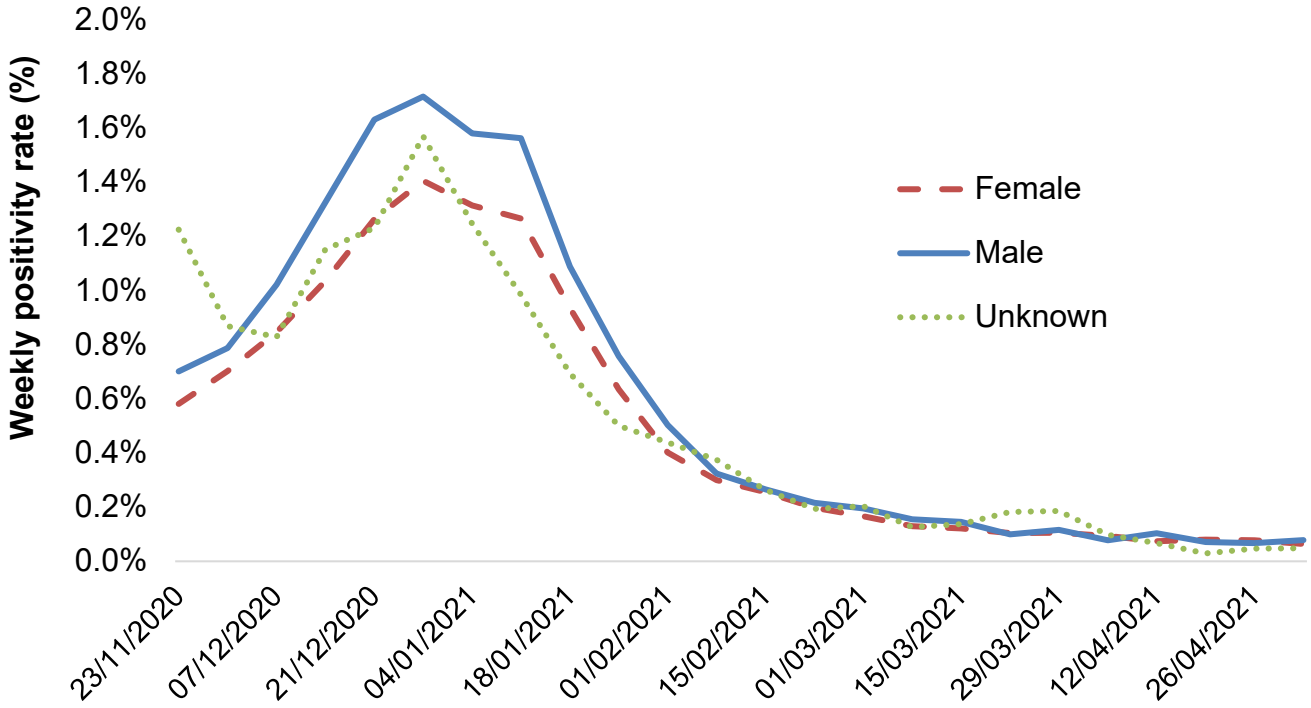

0.03
0.025
0.02
0.015
0.01
0.005
0
Weekly positivity rate (%)
23 Nov 20
23 Dec 20
23 Jan 21
23 Feb 21
23 Mar 21
23 Apr 21
Mixed
Other
White
Unknown
Asian
Black
Chinese
Male
Female
Unknown

Figure 5d



The highest positivity rates among individuals reporting their tests (that is, percentage of people who were positive) were observed in mixed or other ethnicity and these were 0.6% and 0.8% respectively.

Positivity rates of trust types by demographics

In this analysis, the positivity rate is defined as the proportion of those participating in testing that reported a positive result at any time during the 27-week period. Ambulance trusts reported high positivity rates compared with other trust types both over the whole period of the evaluation, and on a week-to-week basis. Analysing positivity rates of trust type by ethnic groups over the whole evaluation period showed highest positivity rate among Black (9.1%) and Mixed (9.0%) ethnic groups. The younger age groups in ambulance trust had the highest rates: 25 to 34 years (10.0%), followed by under 25 years (8.4%) and 35 to 44 years (8.3%).

Table 14. Positivity rates of trust types by demographics for HCWs that reported a test

Table 14a. Ethnicity

Trust type	White	Asian	Black	Chinese	Mixed
Acute	4%	6%	5%	4%	5%
Ambulance	7%	6%	9%	8%	9%
Community	4%	5%	6%	1%	5%
MHLD	4%	4%	5%	5%	4%

Table 14b. Age

Trust type	Under 25	25 to 34	35 to 44	45 to 54	55 to 64	65 and over
Acute	4%	5%	5%	4%	3%	3%
Ambulance					6%	3%
Community	3%	4%	5%	4%	3%	2%
MHLD	5%	4%	4%	3%	3%	3%

Confirmatory PCR concordance

The standard operating procedure states all positive LFDs tests should be confirmed by a PCR test. This could be sought through the trust's local arrangements for PCR testing (results go into Pillar 1) or by booking a test at a Regional or Local Testing Service via the National system (results go into Pillar 2). Some important terms used here are:

- match rate (53%) – this is the percentage of people with a positive LFD test for whom we could find a confirmatory PCR result up to 5 days after the positive LFD result was reported
- concordance (87%) – this is the percentage of matched confirmatory PCR results that were also positive
- specificity (99.5%) – The proportion of people without COVID-19 who were correctly identified as not being positive

Test and Trace data (England residents only, matched using a combination of personal information) showed that out of 41,250 individuals with a positive lateral flow result at an NHS trust, 21,900 (53%) could be matched to a confirmatory PCR within the next 5 days. 15,300 were identified within Pillar 1 (SGSS) with 6,000 identified within Pillar 2 (NPEX).

Of those 21,900 HCWs for whom a matched confirmatory PCR could be found, there were 19,000 positive and 2,800 negative results, corresponding to an 87% concordance with a positive PCR result.

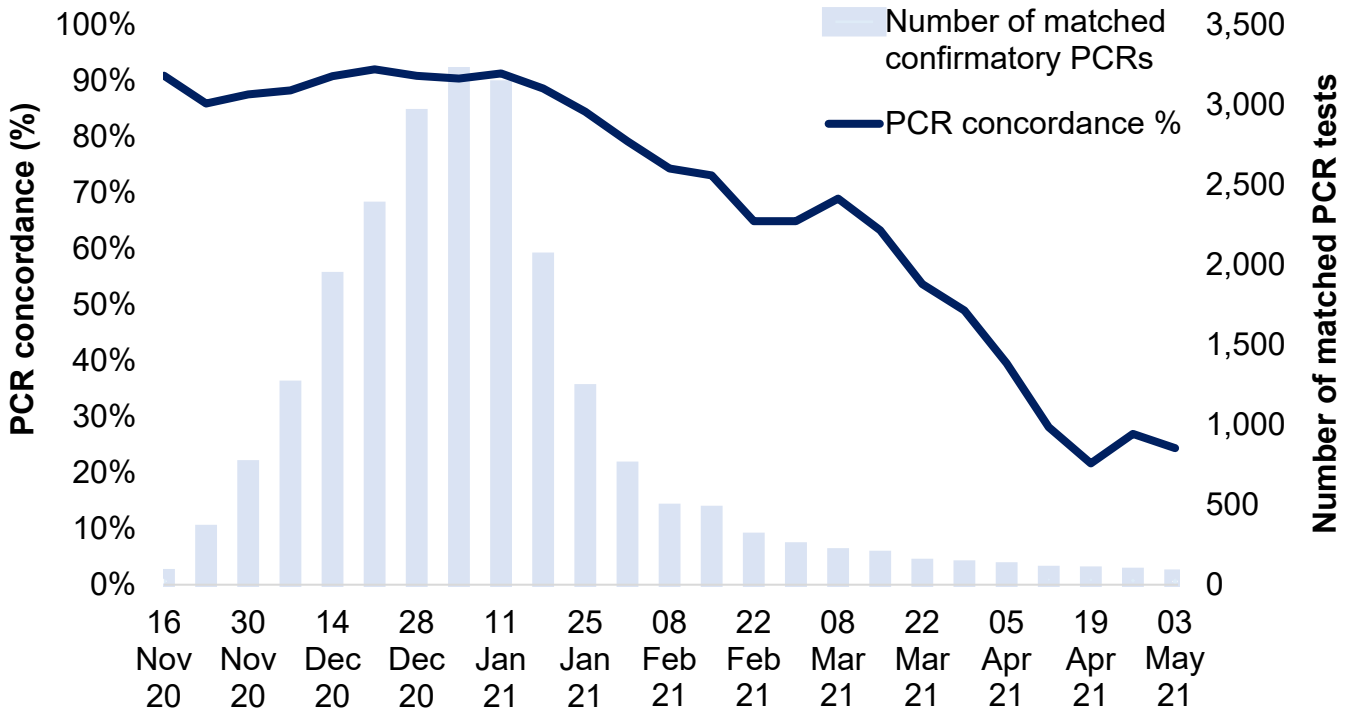
(It is important to note that this does not equate to a 13% false positive rate from the LFD results, as PCR is only performed against the positive LFD results. The false positive rate would be calculated as 13% of positive LFDs that were negative on PCR, as a proportion of total LFD tests performed (that is, 2,800/10.45m). This equates to a false positive rate of 0.027%.)

The proportion of false positive lateral flow test results has remained low throughout this period. The estimation of specificity of the test in this context was based on the assumption that had we been able to match 100% of the positive LFD results to confirmatory PCR tests, there would have been the same concordance of 87%. This increases our 2,800 known false positives from matched PCR tests, to an extrapolated 5,400 false positive LFD results from over 10 million total tests taken over the 27-week evaluation period. This makes a false positive rate of 0.05% or specificity of 99.95%.

While the number of false positives per test remained low over the period, it is a characteristic of all diagnostic tests that the proportion of false positives to all positive results increases as prevalence rates reduce. During periods of high disease prevalence, the concordance rate was approximately 90%. During periods of lower prevalence, concordance dropped to below 30%. While the LFD will continue to detect the majority of true positive highly infectious cases this finding reflects the importance of confirmatory PCR testing in the overall testing intervention in particular in very low prevalence.

(See Lee and others. 'SARS-CoV-2 infectivity by viral load, S gene variants and demographic factors and the utility of lateral flow devices to prevent transmission')

Figure 6. Weekly analysis of confirmatory PCR concordance



The match rate we achieved (53%) was similar to that found in other asymptomatic testing evaluations (data from performance monitoring of LFDs across multiple use cases) but we had anticipated that among NHS health care workers, it might be higher given the importance placed on this by the employing trusts.

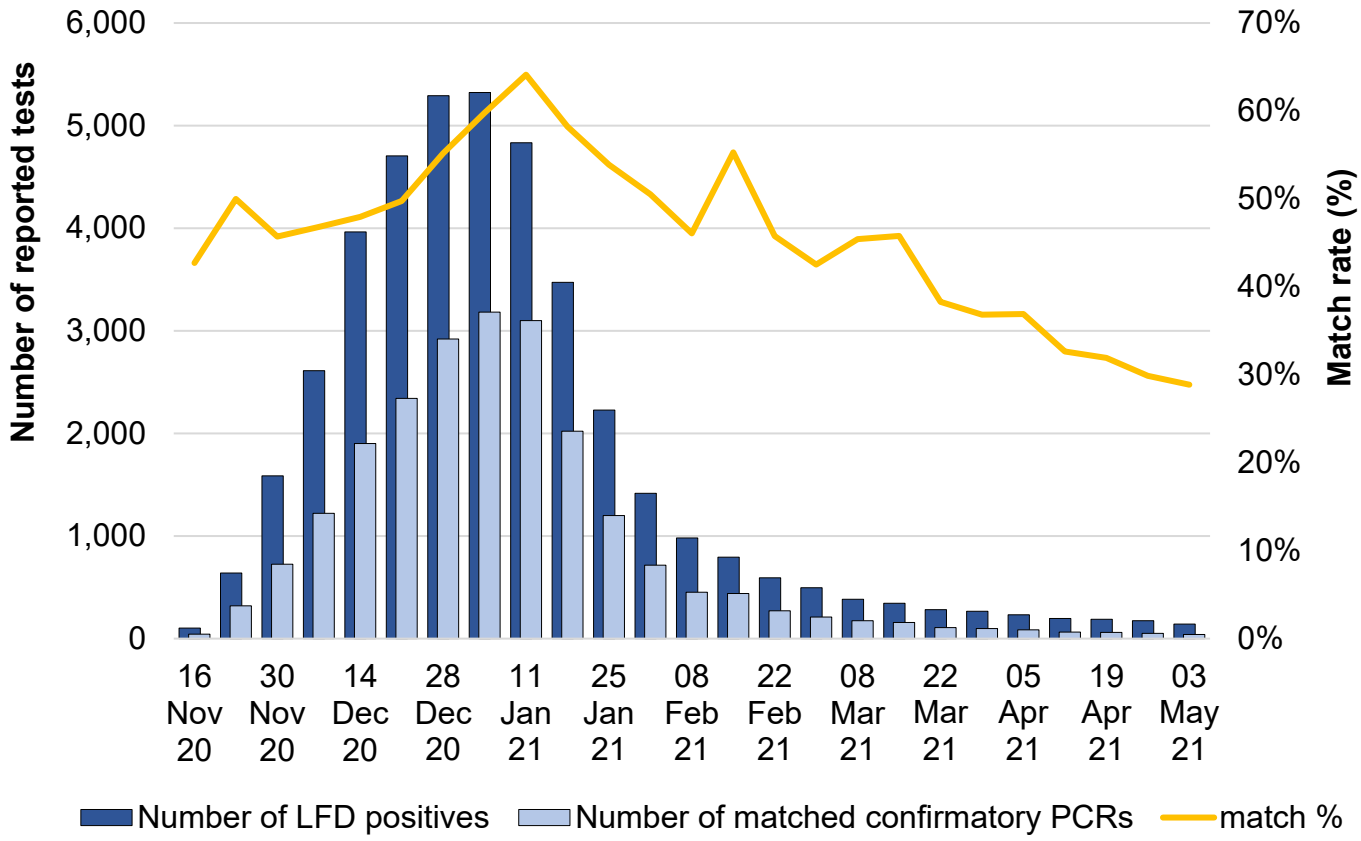
There are considerable issues with the quality of personal identifiable information data with the NHS LFD tests which makes matching to corresponding PCR results harder. In addition, Pillar 2 test data has a unique identifying key to link tests from the same individual, which is not available for the NHS LFD data. We took the following steps to improve the matching rate for confirmatory PCRs, including:

- extending from 3 days to 5 days' time window between the date of the positive LFD result and the date of taking a PCR test

- relaxing the rules for a match (for example, using first 3 characters of a person's name to allow for shortened first names, and hyphenated surnames)
- trying multiple combinations of personal identifiable information (where available) and including a PCR result if any of the following combinations returned a match with the positive LFD result

Surname, Firstname, Postcode
Surname, Firstname, Date of birth
Surname, Firstname, NHS number
Postcode, Date of birth
Surname, Firstname, Email
Surname, Firstname, Mobile

Figure 1. Weekly analysis of confirmatory PCR match rate



We looked at the match rates for individual trusts and found considerable variability. There were 25 trusts with a match rate of over 75%, and 30 with 25% or less. We contacted some trusts with different levels of matching to see if they held their own records or could explain the incomplete matching, but this did not yield any information that led to better matching. We will continue to investigate this by comparing locally held records, where we can access these, with ours.

We concluded that while data quality may have accounted for at least some of the lost matches, it was also likely that some people had not actually sought a confirmatory PCR.

We analysed age and ethnicity for HCWs for whom we could not find a confirmatory PCR (see Table 14) in comparison with those who had a confirmatory PCR test. This shows that HCWs over 65 years old and people of Black ethnicity were less likely to have a confirmatory PCR.

Table 15. Percentage of LFD tests without a matched PCR, by ethnic and age groupings

Age	Total	White	Asian	Black	Mixed
Under 25	44%	43%	47%	55%	50%
25 to 34	44%	44%	46%	44%	45%
35 to 44	48%	48%	47%	49%	47%
45 to 54	50%	51%	48%	55%	46%
55 to 64	52%	52%	46%	57%	53%
65 and over	56%	56%	64%	58%	73%
Total	48%	48%	47%	51%	47%

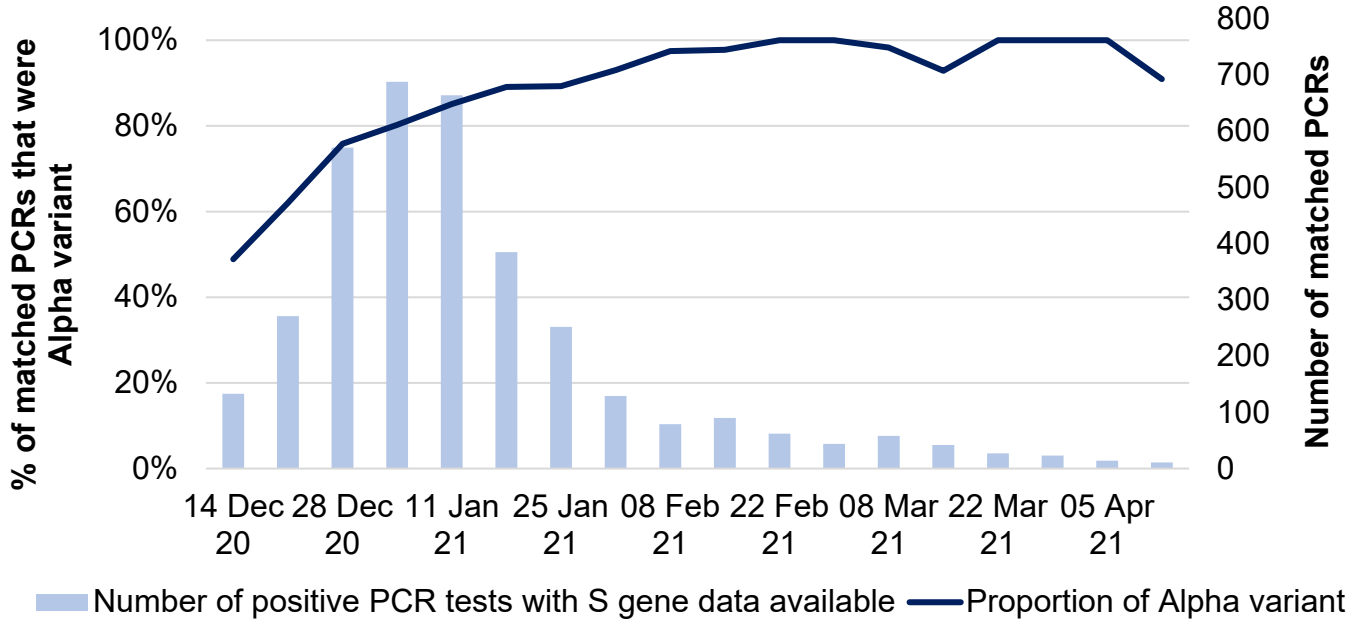
Variant tracking

Genome sequencing data to precisely identify variants identified through the NHS repeat asymptomatic testing programme was not available before March 2021, and then only for a relatively small proportion of positive PCR results.

(Whole genome sequencing, also known as full genome sequencing, complete genome sequencing, or entire genome sequencing, is the process of determining the entirety, or nearly the entirety, of the DNA sequence of an organism's genome at a single time.)

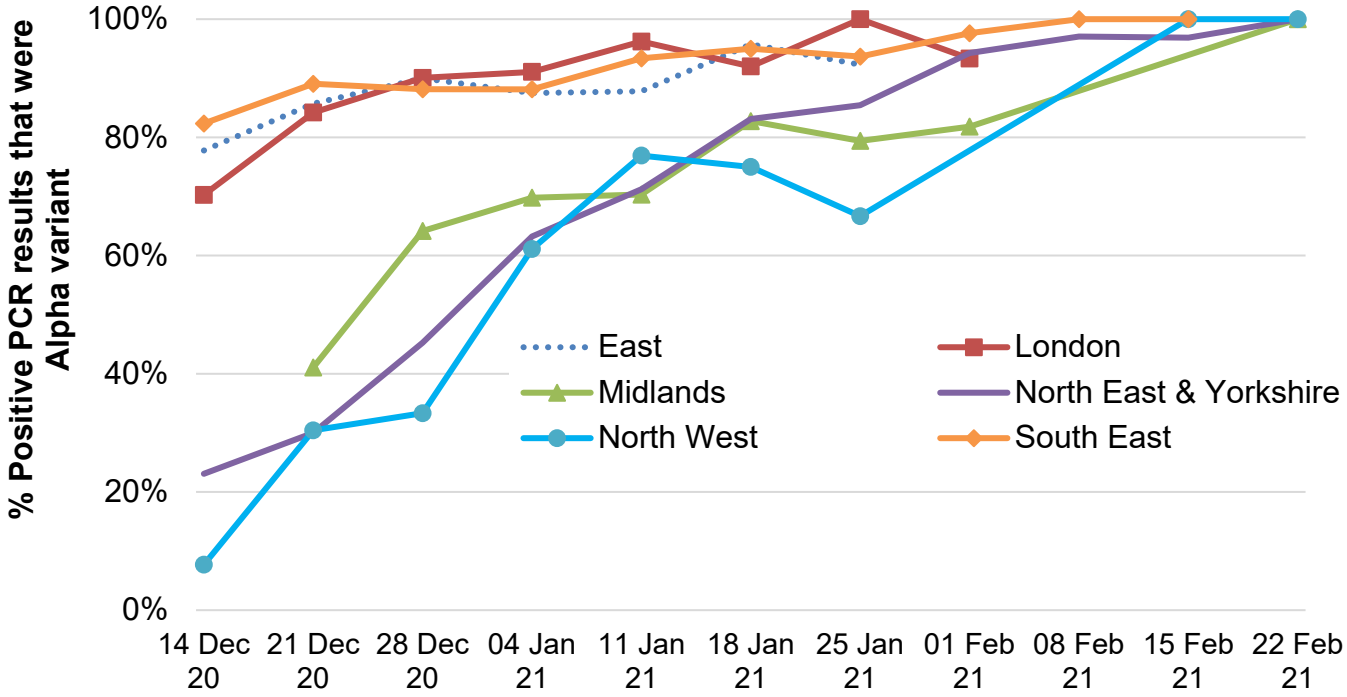
However, Test and Trace data on EDGE does contain information on which key genes were identified in Pillar 2 PCR tests. We were unable to source corresponding data for Pillar 1 PCR tests, which may introduce bias in the following results if there are differences between trusts in the recommended process or ease of access to confirmatory PCR testing.

Figure 8. Proportion of confirmatory PCR positives which were identified as Alpha variant



Looking at regional data, the Alpha variant already accounted for around 70% to 80% of infections in the South East, East and London regions by mid-December 2020. The figure in other regions was much lower, and it wasn't until February 2021 that the Alpha variant accounted for over 90% of cases. Figure 9 effectively shows the journey of the Alpha variant migrating north.

Figure 9. Regional breakdown of increase in Alpha variant over the evaluation period



We were able to link 162 confirmatory PCRs to their genomic sequence outcome performed by COG. (Genome sequencing was conducted by COVID-19 Genomics UK Consortium.)

These samples were sequenced between 1 March 2021 and 9 May 2021. This confirmed the dominant presence of the Alpha variant with 93% of cases.

- 151 cases of Alpha (93%), spread over the entire period data available (1 March to 9 May)
- 1 case of VUI-21FEB-03 on 2 March
- 3 cases of VOC-20DEC-02 between 13 March to 20 March
- 7 cases of VOC-21APR-02/Delta (4%) between 18 April to 9 May

Although there were only 7 cases of Delta identified, they accounted for over half of the 13 positive cases which were sequenced since the first Delta variant was identified on 18 April.

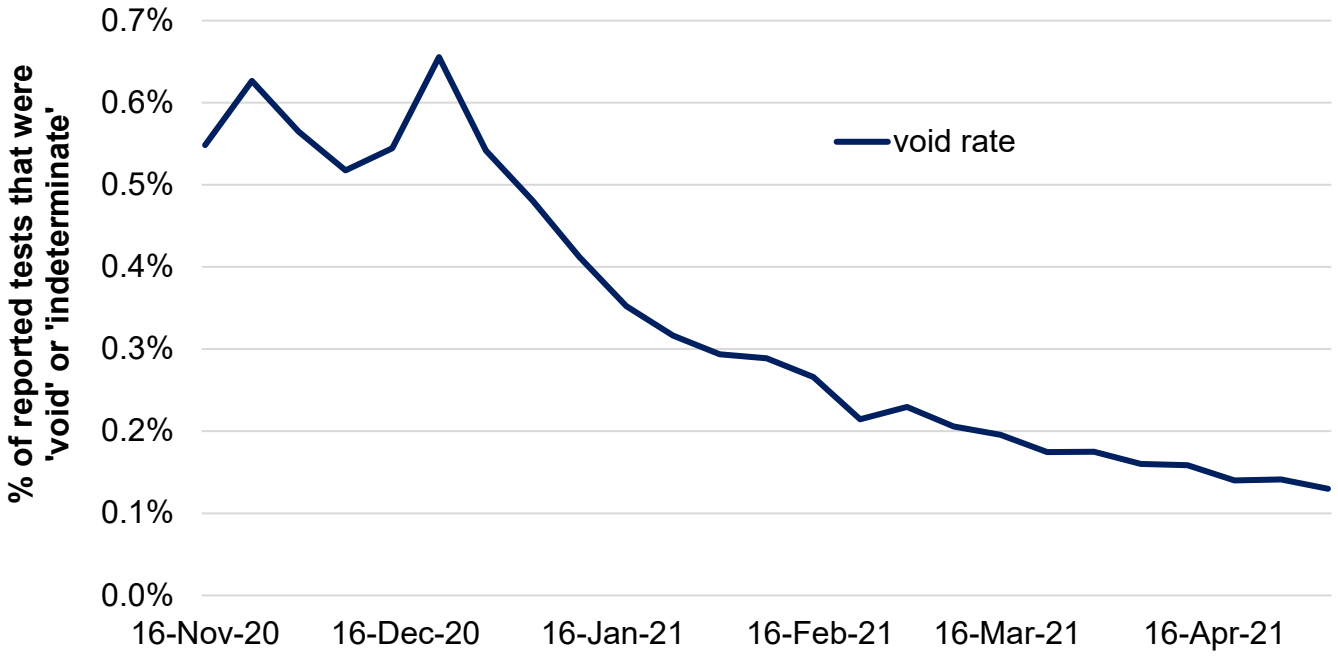
Void results

The proportion of all tests which were reported as void was 0.34%. Figure 10 shows the void rate falling over time, from around 0.6% at the end of 2020, to under 0.15% by May 2021. Further work would be needed to understand why the rate dropped. This may be due to the workforce becoming more experienced in the use of LFDs, changes in test reporting behaviour, or, possibly, changes in test accuracy.

(No evidence from extensive real world performance monitoring that test performance has changed, but it is recognised that people have become a lot better at doing and interpreting the tests.)

This demonstrates the need for ongoing quality assurance and performance monitoring of LFDs in this use case. This had not yet been established during the period of this evaluation but has since commenced.

Figure 10. Reported LFD void rate over time



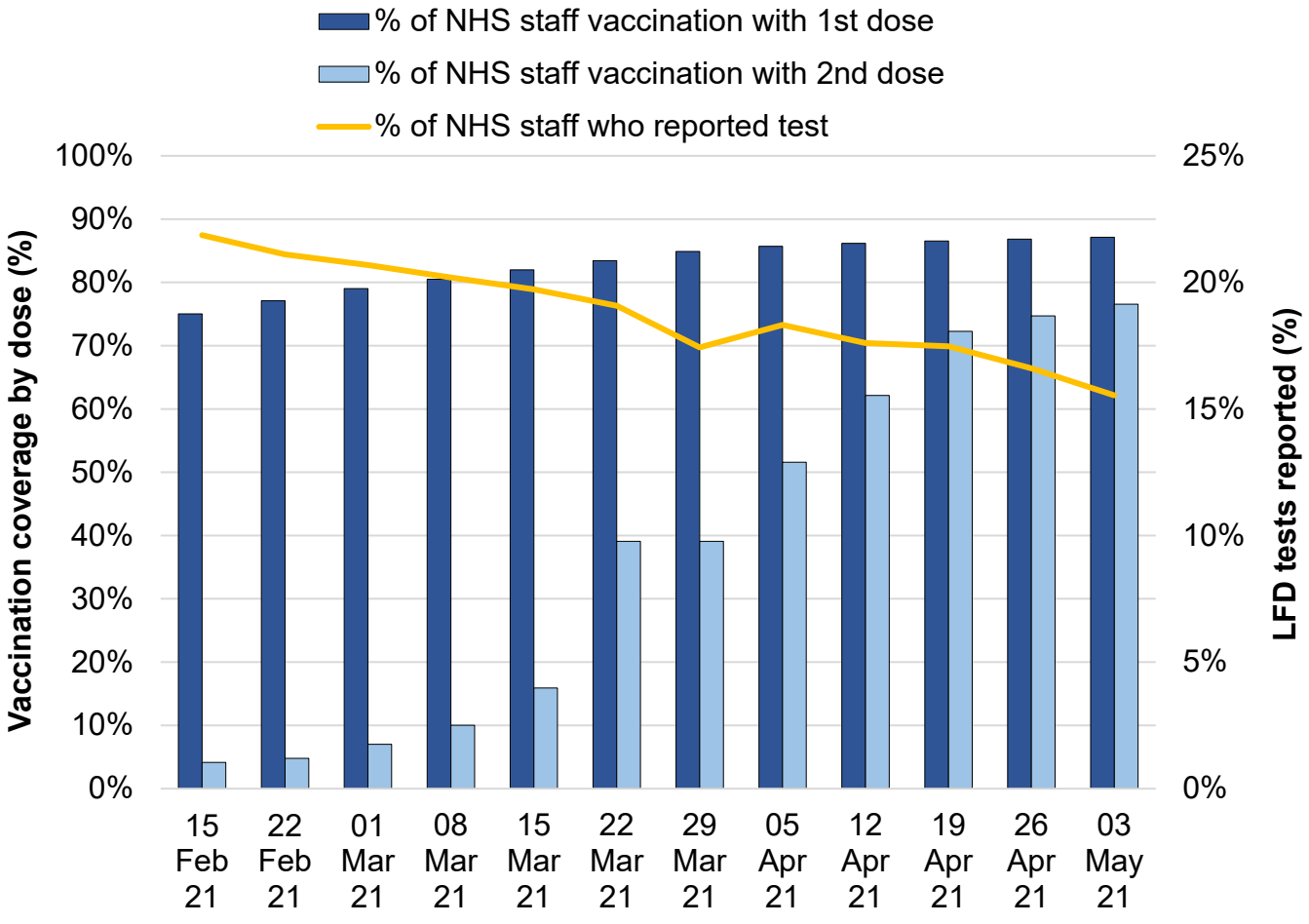
Only 3 trusts had void rates above 1% during the evaluation period. There was one NHS trust that reported 500 voids out of a total of 3,000 reported tests – this is a void rate of 19%, and should be further investigated with the trust to see if this was a batch issue, a training issue or if there was some other explanation.

Vaccination status

Vaccination status of individual people was not available in the management information for this evaluation, so the only way we could look at this was at whole workforce level. The data for HCWs was only available since February 2020 when the vaccination coverage was approximately 70% (prior to that, the data was available for the population as a whole).

To date there are approximately 80% of HCWs that have received a second dose of the vaccine. The proportion of all LFD test results reported does fall as vaccination rates increase. Without being able to link vaccination status to individual HCW and cross reference to their testing profile it is impossible to say whether the trends are directly linked. The trends for vaccination status and decrease in LFD testing reporting are shown in Figure 11 below.

Figure 2. Number of tests reported compared to vaccination rate over time



There is an association of increasing uptake of vaccine and declining numbers of reported tests, however we are not in a position to demonstrate a causal effect and any behavioural factors behind this.

Efficiency of nasal swabbing

The CMA of NHSEI Test and Trace advised that it would be acceptable to do repeat asymptomatic testing using a sampling technique that was not in the manufacturers' instruction, namely swabbing both nostrils to the mid-turbinate level and not swabbing the tonsillar area of the oropharynx. This was a pragmatic decision taken in the interests of encouraging better uptake by HCWs. (This approach was also communicated to and acknowledged by MHRA.)

The test results data reported by HCWs following this guidance is the largest series of reported results from this type of sampling with the Innova LFD.

In order to understand the reliability of swab samples taken in this way, it may be possible using the cycle threshold (Ct) values as a proxy for viral concentration to compare he results from confirmatory PCR tests associated with these HCWs LFD results with geographically matched samples in the ONS REACT study, that would have been collected using the standard nose+throat swabbing.

Supplementary analysis (May to September 2021)

Following the main analysis of the first 27 weeks of the repeat asymptomatic testing initiative, we undertook a supplementary analysis of lateral flow testing behaviours and reported results from 10 May 2021 to 26 September 2021, a period of a further 19 weeks. This second period of analysis corresponds with both the Delta variant establishing itself as dominant across the UK, and with near-complete coverage of immunisation by 2 vaccination doses to HCWs. For this supplementary analysis, we have looked at reported testing behaviours and results by trust type and by NHS region, but not at demographic characteristics.

Number of tests reported and number of people reporting tests

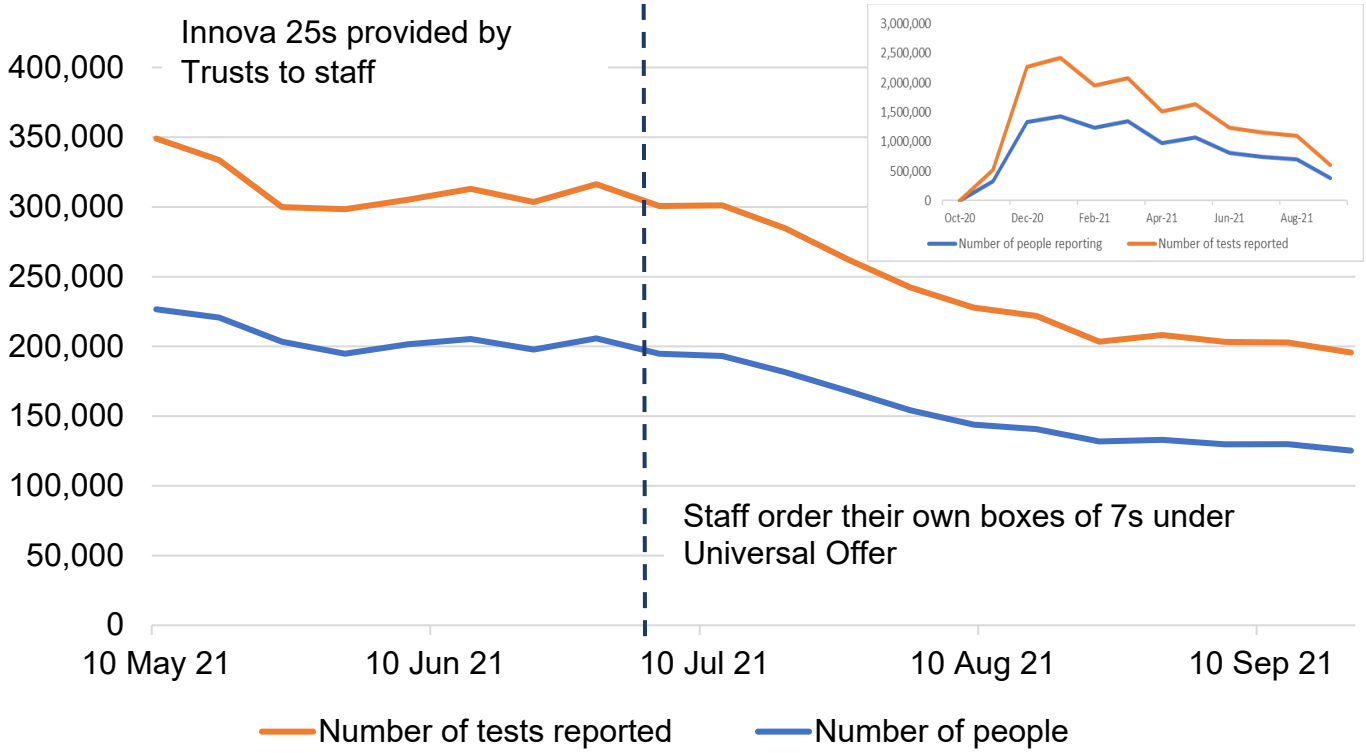
During this period, there were approximately 10,400 positive results from 5.3 million reported tests from 447,000 people taking part in self-testing using LFDs. That is a positivity rate of 0.2% by test, and 2.3% by individual HCW who took part over the whole evaluation period.

Weekly analysis of reported test results

The numbers of tests reported between May 2021 and September 2021 by the HCWs falling in to this evaluation continued to fall despite the rise in cases in England from the start of July 2021 (see Figure 12 main graph). (Source: COVID-19 cases in England)

The total number of LFD tests reported fell more rapidly between 12 July 2021 and 9 August 2021 after which the weekly decrease in number of tests reported began to level out (see figure 12). In early July 2021, the provision of test kits to HCWs changed from a ‘push’ model to a ‘pull’ model. Once supplies of test kits in trusts had been exhausted, HCWs were told to acquire their own test kits through the channels available for the Universal Testing Offer. Most COVID-19 related restrictions were lifted in England on the 19 July 2021.

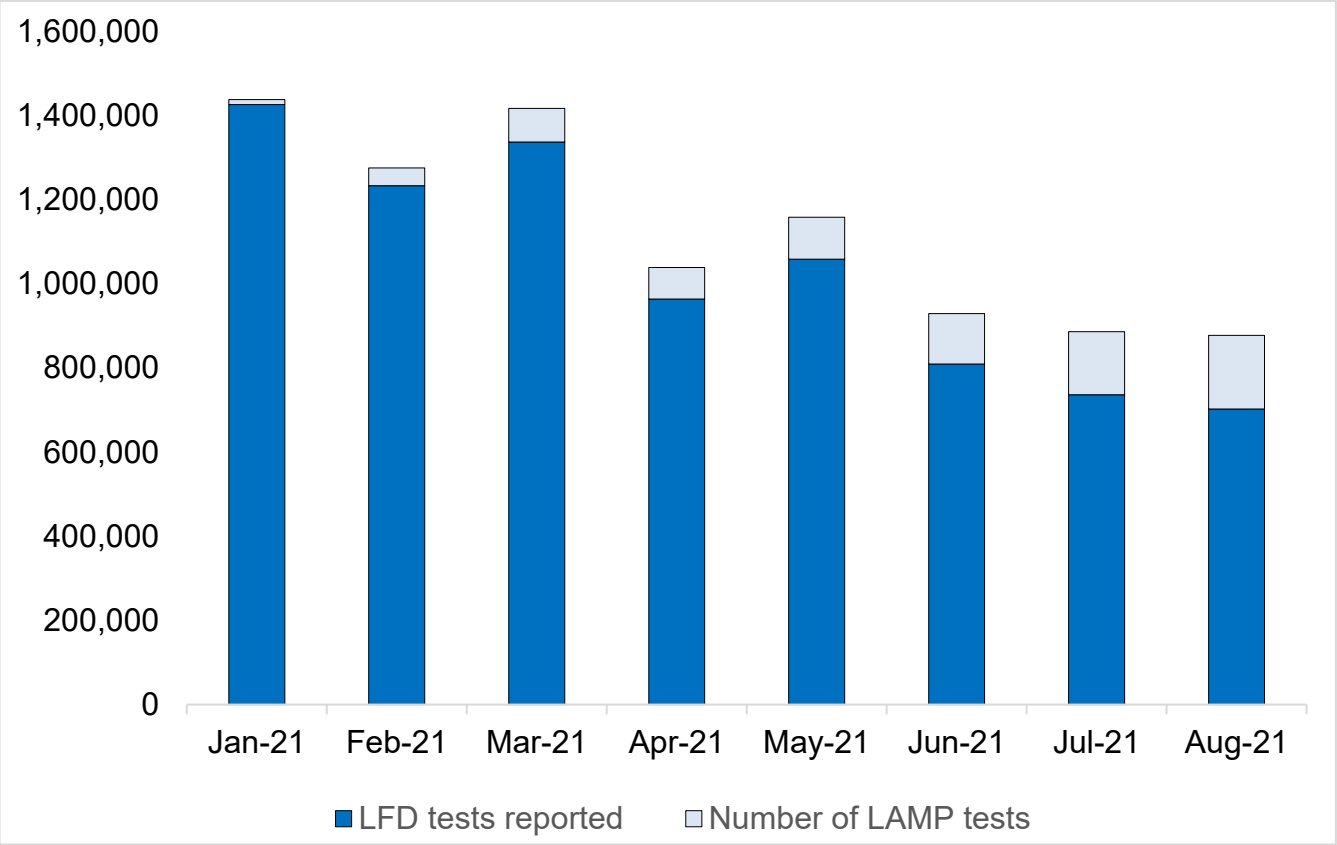
Figure 12. Weekly reported tests by HCWs (all trusts, May to September 2021) [inset graph shows all reported tests since Nov 2020]



Reporting rates in this evaluation could have declined for a number of reasons: the one likely to account for the biggest drop-off is that after early July 2021, staff at many trusts were asked to report their results directly through the GOV.UK reporting tool and those results would not have been picked up in this evaluation. The split between trusts submitting results on behalf of their workforce and trusts where staff are reporting directly is not readily available.

Another possible cause of drop-off is that there was an increase in the number of trusts using LAMP as their testing technology. However an analysis of the contribution of LAMP to all asymptomatic testing shows that the impact of this was relatively modest (see Figure 13). Unlike LFD results which have to be actively reported, all LAMP tests results are automatically reported by the laboratory in which they are processed so the absolute number is always known.

Figure 13. Contribution of LAMP testing to routine asymptomatic testing among HCWs in trusts (January to August 2021)



Weekly analysis of reported test results by region

The highest number of tests reported were observed in the South East with 20% of HCWs in that region reporting at least one test and this region also had the greatest mean number of tests reported per HCW. The largest reduction in testing was seen in the North West, with 64% reduction in the number of HCWs taking at least one test between the first and second evaluation period. The South East was least affected by the drop off in testing with 41% fewer HCWs taking at least one test between the first and second evaluation period.

Table 16. Summary of tests reported by NHS region (May to September 2021)

Region	% of NHS workforce	Number of reported tests	Number of HCWs reporting at least one test	% of total tests reported	Staff who reported at least one test %	Tests reported per person (mean)
East of England	9%	505,749	47,481	9%	11%	11
London	16%	576,381	58,524	11%	13%	10
Midlands	19%	954,368	87,190	18%	19%	11
North East and Yorkshire	17%	944,177	73,781	18%	16%	13
North West	15%	518,882	44,768	10%	10%	12
South East	14%	1,335,224	91,457	25%	20%	15
South West	10%	537,691	44,656	10%	10%	12

Weekly analysis of reported test results by trust type

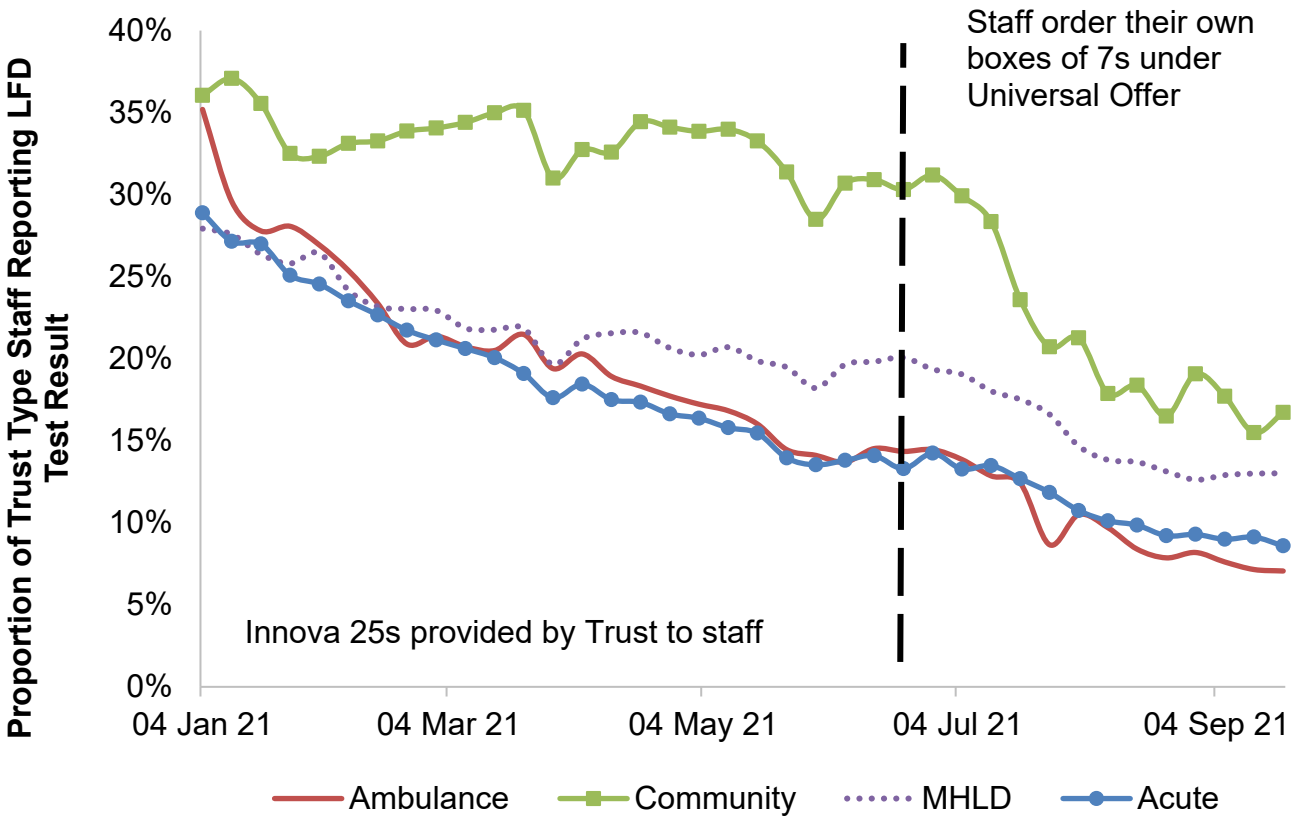
The highest number of tests reported were observed in acute trusts which reported 67% of all tests within the May to September 2021 period, which is expected as acute trusts make up the largest proportion of the NHS workforce. The greatest reduction in testing was seen in ambulance trusts, with 58% fewer HCWs taking at least one test between the first and second evaluation period. Community and MHLD trusts were least affected by the drop off in testing with 30% and 31% respectively less HCWs taking at least one test between the first and second evaluation period.

Table 17. Summary of tests reported by NHS trust type (May to September 2021)

Trust type	% of NHS workforce	Number of reported tests	HCWs reporting at least one test	% of total tests reported	% staff who reported at least one test	Tests reported per HCW (mean)
Acute	75%	3,612,027	305,348	67%	31%	12
Ambulance	4%	173,551	18,521	3%	37%	9
Community	4%	399,287	31,443	7%	61%	13
MHLD	17%	1,187,607	92,545	22%	41%	13

Analysis of the weekly proportion of trust staff that reported an LFD result showed that community trust staff were consistently the most likely to report a result over the entire evaluation period. However, community trusts also demonstrated the largest reduction in reporting rates after the move to HCWs requesting LFD tests under the universal offer.

Figure 14. Weekly proportion of HCW reporting an LFD result by trust type (May to September 2021)

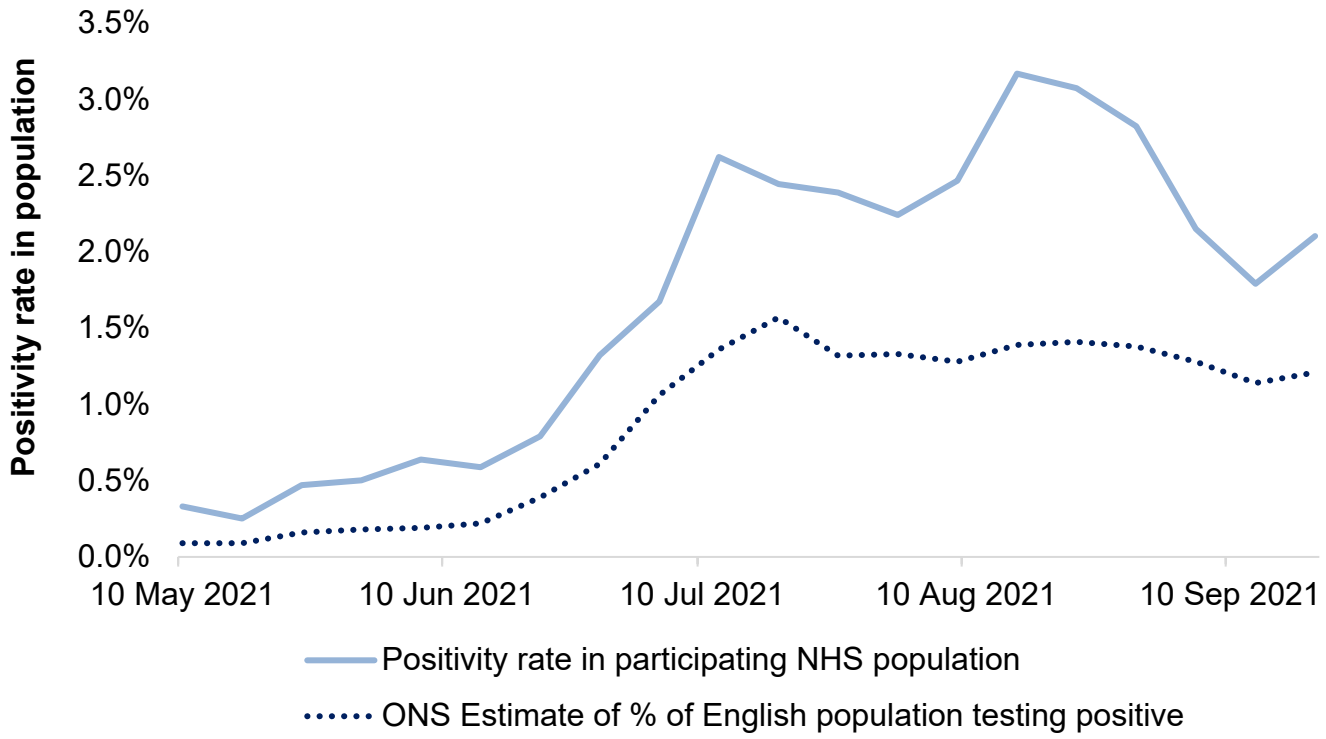


Weekly analysis of positive reported test results

The weekly reported positive test results as a proportion of all HCWs who reported a test rapidly rose between 21 June 2021 and 12 July 2021. There was also a second peak in mid-August, followed by a decline in September.

Set against a context of ONS weekly estimated prevalence from the REACT study, NHS HCWs could appear to have been more severely impacted over this time period than the population as a whole. However, the ONS study is population-wide with broader demographics than the NHS, so this adds context only, we do not attempt to draw direct comparison.

Figure 15. Comparison of weekly trend in positivity rate HCWs and ONS estimation of % of English population testing positive (May to September 2021)



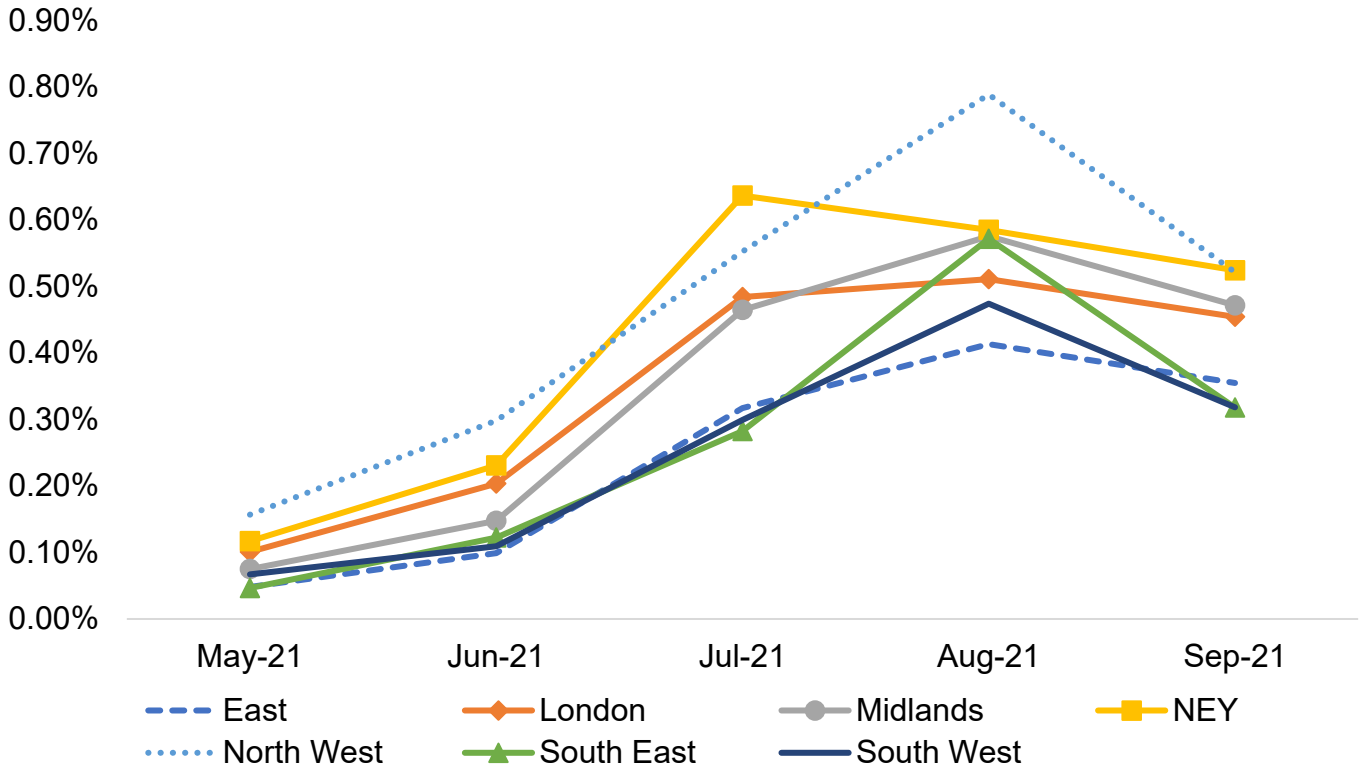
Weekly analysis of positive reported test results by region

The highest weekly positivity rates within the reporting population observed during the May to September period were in the North West (1.4%) and the South East (1.4%). The lowest weekly positivity rates within the reporting population observed between May and September were in the East of England (0.5%).

Table 18. Positivity rates for HCWs who reported a test by NHS region (May to September 2021)

Region	NHS head count	Number that reported at least one test	Number of HCWs positive	Weekly maximum positivity rate of reported tests	Positivity rate of reported tests over 19 week period
East	124,170	47,481	634	0.50%	1.30%
London	216,350	58.524	1,269	0.70%	2.20%
Midlands	247,630	87,190	1,883	0.70%	2.20%
North East and Yorkshire	221,110	73,781	2,380	0.90%	3.20%
North West	201,450	44,768	1,440	1.40%	3.20%
South East	179,000	91,457	2,125	1.40%	2.30%
South West	129,840	44,656	742	0.60%	1.70%

Figure 16. Monthly trend in positivity rate of reported test in HCWs by region (May to September 2021)



The August peak observed in the regional data is likely to be explained by specific reporting behaviours of some individual trusts. One trust (in the South East) reported 76% of their total positive results since testing commenced in the week commencing 16 August 2021, and another trust (in the North West) reported 38% of their total positive results) in the week commencing 24 August 2021. It is unlikely that all these positive results were concentrated at these 2 trusts into these 2 weeks of August, but we have no way apportion them differently.

Weekly analysis of positive reported results by trust type

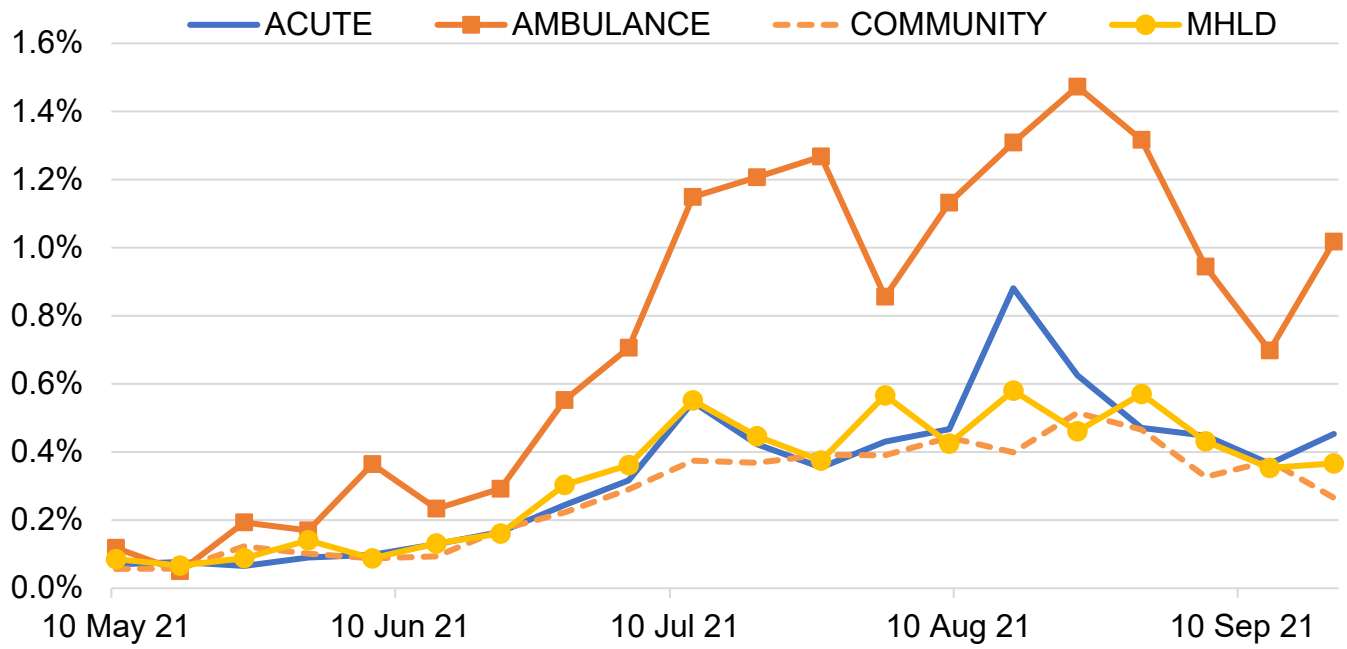
The highest weekly positivity rates within the reporting population observed during the May to September period were in ambulance trusts (1.5%). The lowest positivity rates within the reporting population observed in community trusts (0.5%).

Table 19. Positivity rates for HCWs who reported a test by NHS trust type (May to September 2021)

Trust type	NHS head count	Number that reported at least one test	Number of HCWs positive	Weekly maximum positivity rate of reported tests	Positivity rate of reported tests over 19 week period
Acute	973,280	305,348	6,907	0.90%	2.30%
Ambulance	50,090	18,521	731	1.50%	3.90%
Community	51,790	31,443	600	0.50%	1.90%
MHLD	226,400	92,545	2,235	0.60%	2.40%

The weekly proportion of reported positive tests was consistently greater in ambulance trusts compared to other trusts. However, this should be considered with caution as it may not be a true reflection of how SARS-CoV-2 has affected the workforce of ambulance trusts. It is important to note that the denominator in this calculation of positivity is the number of HCWs who have reported a result. While ambulance and community trusts have a similar total headcount (approximately 50,000), almost twice as many community HCWs reported an LFD test result compared to ambulance HCWs (31,000 compared to 18,000). Therefore the denominator used to calculate the positivity in ambulance trusts is relatively smaller and the percentage of HCWs testing positive over the whole 19-week period is nearly twice that seen in other trust types (see Table 21).

Figure 17. Weekly trend in positivity rate of reported tests in HCWs by NHS trust type (May to September 2021)



A comparison of the weekly reported results for ambulance and community trusts is shown in Figure 17. There is a marked decrease in the number of reported tests for ambulance trusts in the second evaluation period compared to the second, which has decreased the denominator significantly when analysing positive rates for ambulance trusts during this period.

Figure 18. Proportion of NHS trust staff reporting a test result and positivity for ambulance and community trusts (November 2020 to September 2021)

Figure 18a

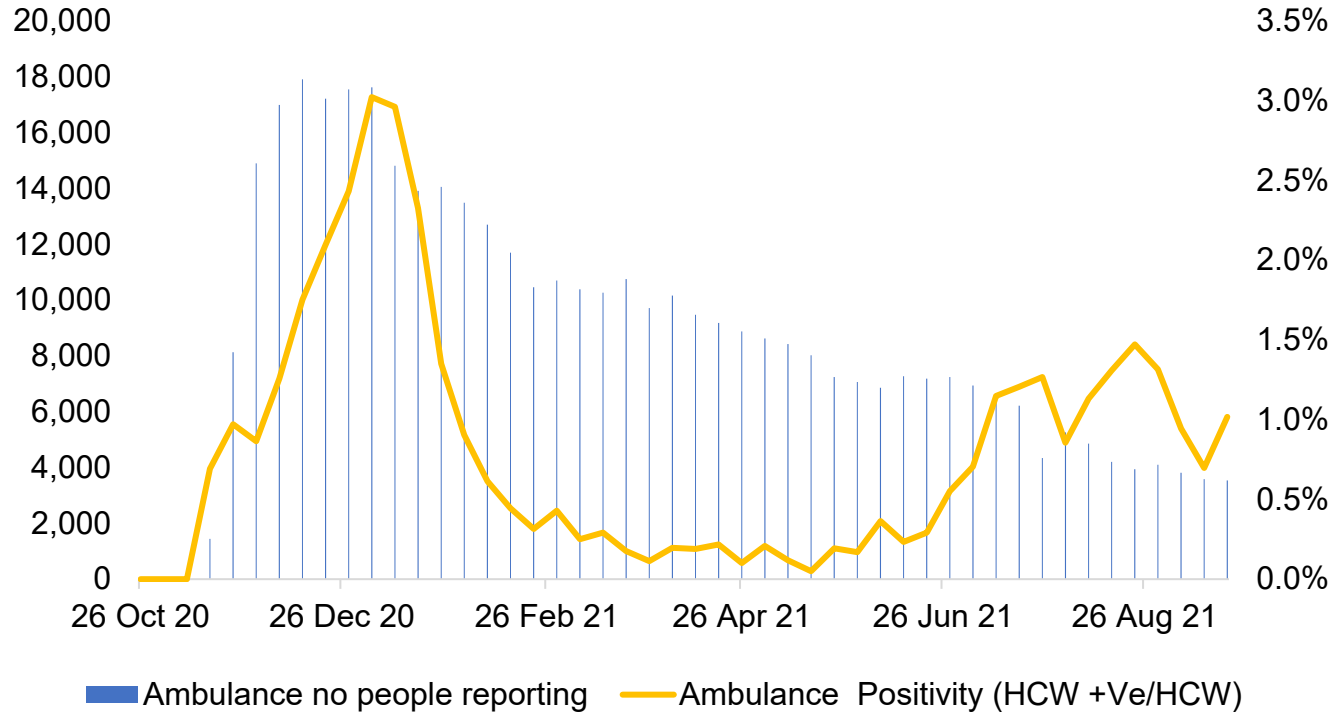
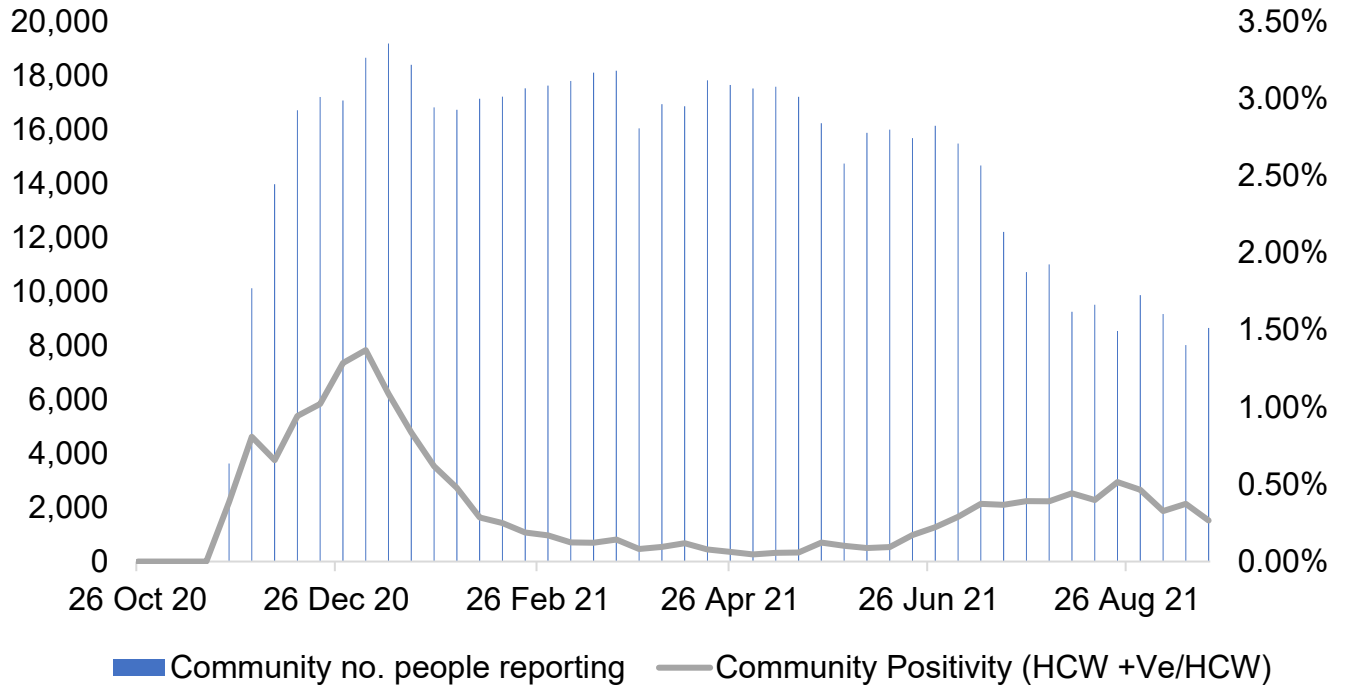


Figure 18b



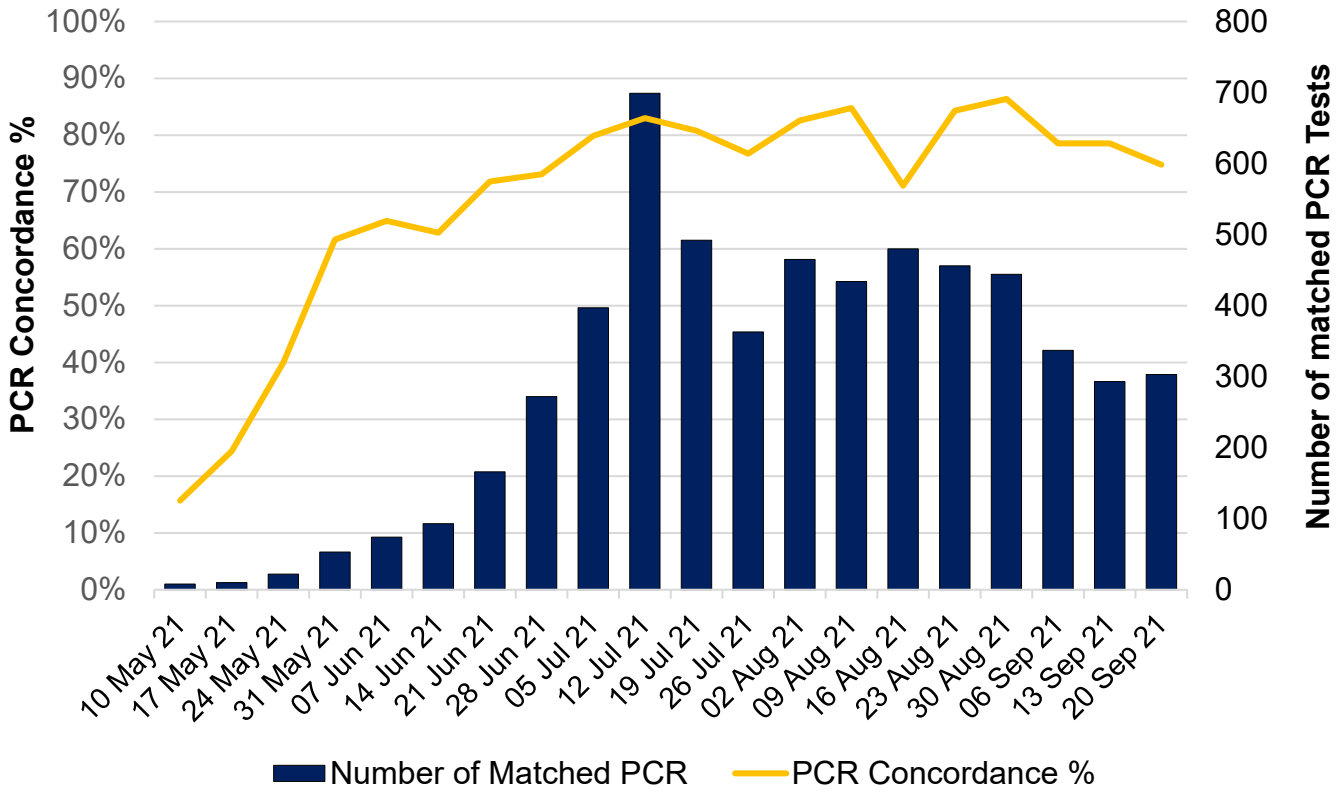
Confirmatory PCR concordance

The same methodology for matching positive LFDs to confirmatory PCR tests that was employed in the initial analysis was employed during the second analysis.

During this supplementary analysis period Test and Trace data (England residents only, matched using a combination of personal information) showed that out of 11,262 individuals with a positive lateral flow result at an NHS trust, 7,593 (67%) could be matched to a confirmatory PCR within the next 5 days. The proportion of positive LFDs matched to a confirmatory PCR has increased from the initial analysis between September 2020 and May 2021 (52%).

Of those 7,593 HCWs for whom a matched confirmatory PCR could be found, there were 5,861 positive and 1,670 negative results, corresponding to an 78% concordance, which is a fall from 87% during the initial analysis.

Figure 19. Weekly trend of matched PCR concordance (May to September 2021)



Confirmatory PCR concordance by region

The Midlands had the greatest proportion of matched positive LFDs to confirmatory PCR test (74%), the South East had the fewest positive LFDs matched to a confirmatory PCR test (59%).

Table 20. Matched PCR concordance by region over the 19 week period (May to September 2021)

Region	Total	Unmatched	Positive	Negative	Void	% matched	% concordance
East	700	207	388	104	1	70%	79%
London	1,335	469	703	144	19	65%	83%
Midlands	1,979	512	1,150	311	6	74%	79%
North East and Yorkshire	2,528	708	1,480	333	7	72%	82%
North West	1,523	513	791	214	5	66%	79%
South East	2,388	970	969	427	22	59%	69%
South West	809	290	380	137	2	64%	74%

Confirmatory PCR concordance by trust type

Acute trusts had the greatest proportion of matched positive LFDs to confirmatory PCR test (58%), community trusts had the least number of positive LFDs matched to a confirmatory PCR test (41%). Of those LFD positive tests that could be matched to a confirmatory PCR, the concordance did not vary much between trust type.

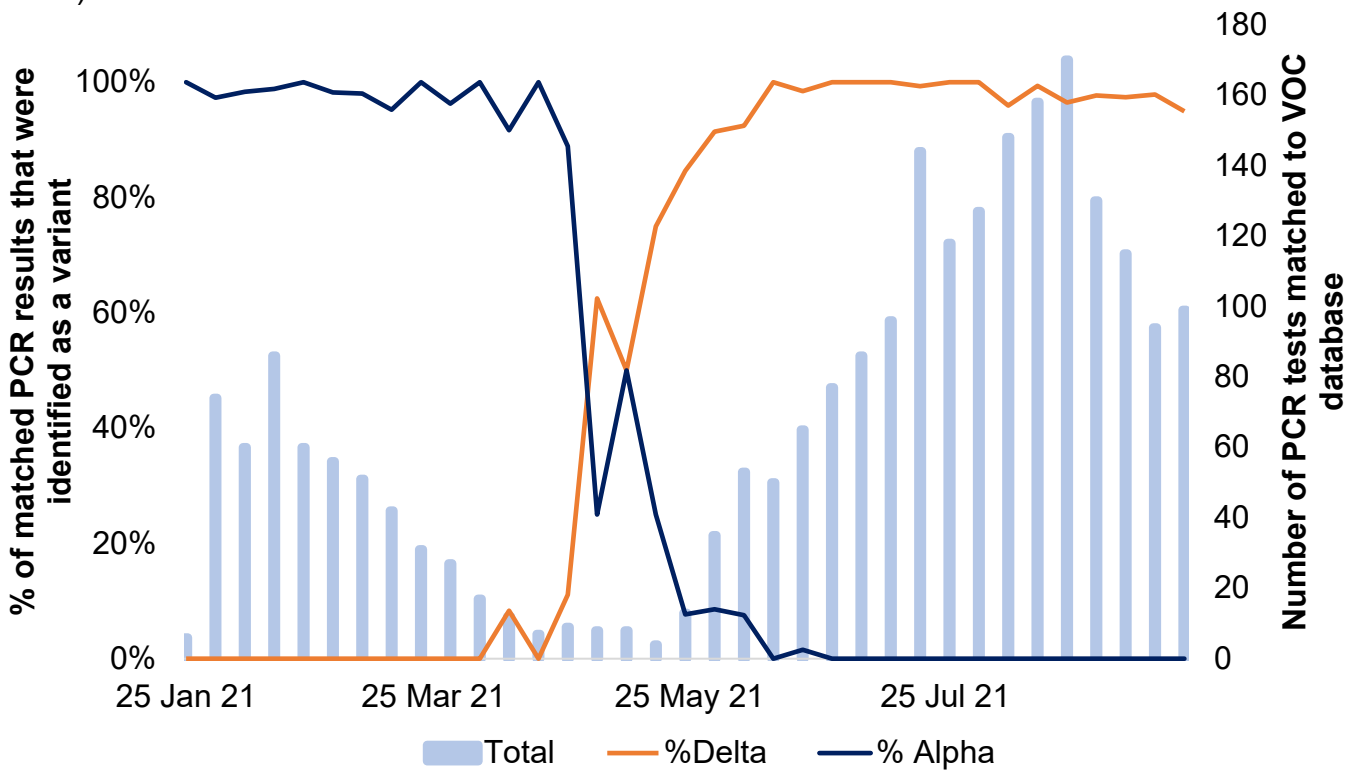
Variant tracking

Between 10 May and 26 September 2021 1,081 positive PCR results were matched to variant data, of which 99% were found to be Delta variant and only 1% of Alpha variant. A smaller number of positive PCR tests were attributed to a certain variant in the second evaluation period due to matching to the variant of concern (VOC) database as opposed to using data solely from EDGE where it was possible to use the missing S gene as a proxy for the Alpha variant.

Between 25 January 2021 and 26 September 2021, there were 2,336 PCR tests matched to data in the VOC database in EDGE. By the beginning of July, 100% of matched positive PCR tests were Delta variant. The Delta variant overtook the Alpha variant as the dominant strain the week commencing 10 May 2021, this corresponds to the data collected by the Sanger Institute, which showed that Delta variant overtook Alpha in mid-May 2021.

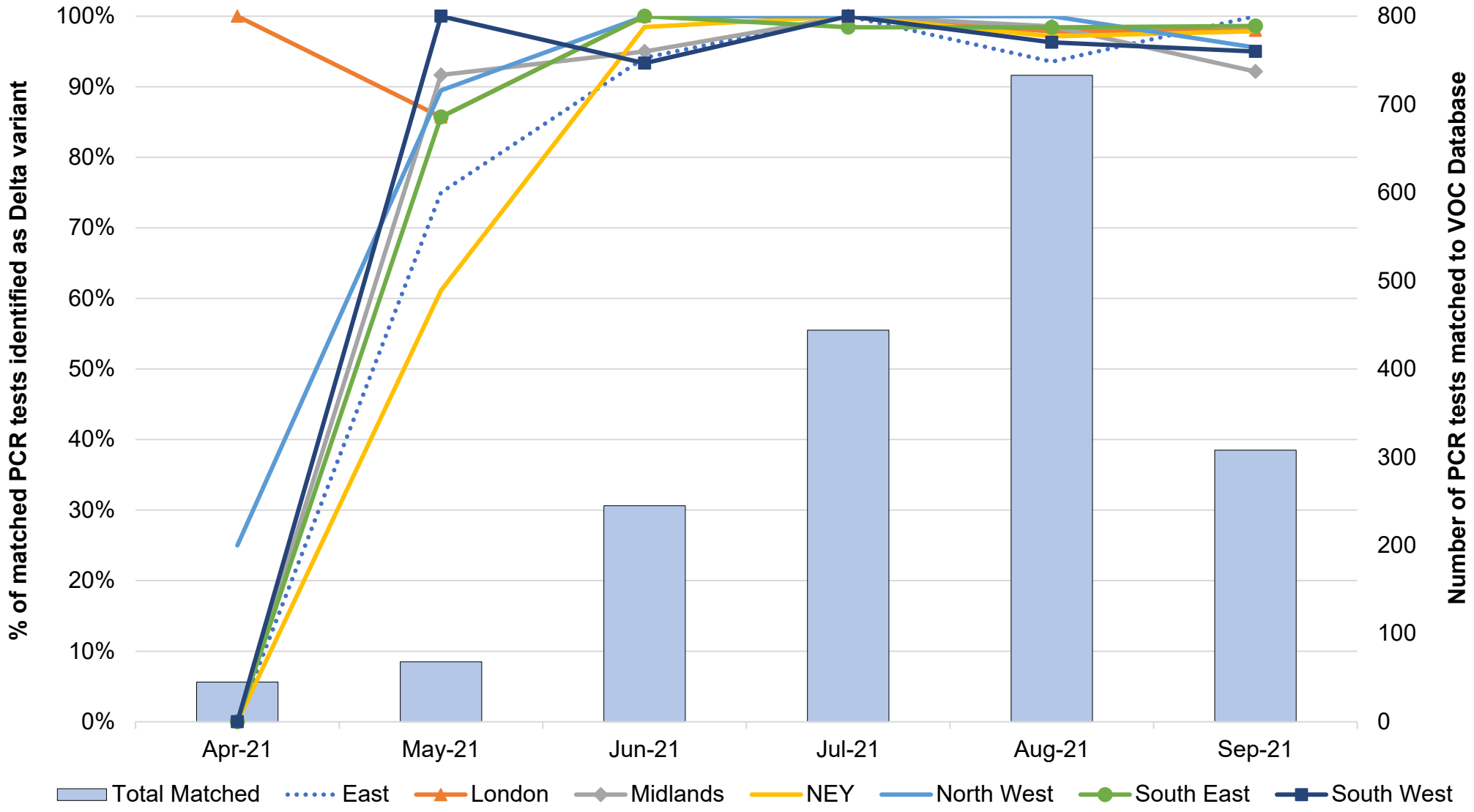
Figure 3. Proportion of confirmatory PCR positives which could be matched to variant type in the VOC database (May to September 2021)

(Data taken from VOC database within EDGE matched to matched confirmatory PCR tests. Figure 8 data sourced using missing S gene as proxy for Alpha variant from confirmatory PCR tests.)



Looking at regional data, the Delta variant did not show any geographical variation and overtook the Alpha variant as the dominant strain at the same rate in all regions, however it is important to note that the sample size used in this analysis is small.

Figure 21. Regional breakdown of increase in Delta variant over the evaluation period matched to the VOC database (May to September 2021)



Conclusions and recommendations

It has been possible to analyse existing management information to evaluate the impact of repeat asymptomatic testing among healthcare workers in the NHS using LFDs.

The evaluation was conducted in real time in Spring-Summer-Autumn of 2021. During this time it was possible to make practical recommendations for operational service improvement that NHSE and/or the individual NHS trust were able to action upon, such as reinforcing the need for ongoing testing especially among younger age groups and after vaccination. Additionally, these addressed tactical issues around data collection and entry as well as more strategic issues such as the establishing side-by-side LFD and PCR testing to collect 'paired' samples of tests to enable real world performance monitoring.

Over the first 27 weeks of the testing intervention, there were approximately 40,000 positive results from 10.4 million reported tests from 908,000 people taking part in self-testing using LFDs in the NHS organisation in scope of the evaluation. That is a positivity rate of 0.4% by test, and 4% by individual HCW who took part over the whole evaluation period.

Over half of the positive LFDs were matched to a confirmatory PCR, with 87% concordance. These individuals were either detected before they became symptomatic, or would never have become symptomatic, and either way would have posed a transmission risk to colleagues, patients and other close contacts. We found that LFDs were able to detect the Alpha variant, and there was emerging evidence that they would be able to detect the Delta variant. The Alpha variant became dominant by the end of February 2021, showing a geographic pattern of spread roughly from South East to North West.

Over the second 19 weeks of the intervention, there were approximately 10,400 positive results from 5.4 million reported tests from 447,000 people taking part in self-testing using LFDs. That is a positivity rate of 0.2% by test, and 2% by individual HCW who took part over the second evaluation period. Over half of the positive LFDs were matched to a confirmatory PCR, with 78% concordance. By mid May 2021 the Delta variant had become dominant, spreading rapidly to all areas with no discernible geographic pattern.

The evaluation has thrown up questions and issues that we have not been able to resolve without further enquiry:

- reasons why people do and do not report test results, including why there has been a decline in reporting between January to May 2021
- the difference in activity between tests taken and tests reported
- relationship between demography and testing and reporting
- relationship between vaccination and testing and reporting
- reason why people do or do not seek a confirmatory PCR test

- the ways that different trusts handle messaging with their staff on testing, reporting, confirmatory PCRs and so on
- explanation of higher positivity (by test and by number of people participating) in ambulance trusts to determine if this is genuine or an artefact related to reporting patterns

There is further work that would enhance this quantitative evaluation:

- analysis of utilisation of allocated LFDs – unused boxes and unused kits in started boxes
- compare this with re-ordering stats from trusts to understand demand
- efficacy of nasal swabbing versus nose and throat – this is the largest series of nasal only Innova LFDs, with 6,000 confirmed positive PCR results from the 3 directly comparable Lighthouse Labs (Milton Keynes, Alderly Park and Glasgow)

Appendix 1. Briefing note from NHSE/I on the rollout of testing in the NHS

When LFD tests were made available by the government in November 2020, they were rolled out at speed to asymptomatic patient-facing staff in the NHS for twice weekly testing. This rollout started with acute and ambulance trusts, moving then to other secondary care areas: mental health, independent sector and community trusts. Boxes of Innova 25s were shipped to each provider, for distribution to their staff. The speed of the rollout was such that no central results reporting system was initially available, so each individual trust developed their own results reporting system and uploaded the data to PHE.

From late December 2020 and into January 2021, tests were rolled out to all areas of primary care: general practice, optometry, dentistry and pharmacy. These tests were ordered via more of a 'pull' model, whereby small practices input their data into a central ordering system and requested tests to be despatched. Tests were also made available to all vaccine centres and their staff and volunteers. At this point, NHS Digital had built a central results reporting system on GOV.UK, and primary care and vaccine centre staff were directed to report results via this system. Test and Trace co-ordinated the collation of results into a central database, although these data were not initially able to be shared routinely back with the NHS. From March 2021, secondary care staff have been able in theory to record their results on the GOV.UK system instead of to their local trust. However, not all trusts yet appear on the trust drop-down.

From April 2021, the UK has had a Universal Testing Offer to all members of the public, and we are aware that some NHS staff have accessed LFDs and reported results via other routes, for example, their children's schools. In practice, this also extended the staff testing offer from patient-facing staff to all NHS staff. In July 2021, the NHS moved to a full 'pull' model of ordering tests, and boxes of tests no longer were sent in bulk to trusts. Instead, NHS staff have been able to order packs of 7 LFD tests for home delivery, and directed to report the results of these on the GOV.UK websites. These tests come from multiple suppliers, with differing swab methodologies, and a hybrid supply model has been in place whilst stock of Innova 25s held by NHS employers are depleted. At the current time therefore, NHS organisations are using a variety of brands of tests and therefore following differing Standard Operating Procedures for ordering, swabbing, and reporting results.

LAMP rollout began following the prime ministers announcement of the 16 October 2020 when he launched 8 sites who would begin to roll out LAMP saliva to staff at surrounding trusts. New laboratories serving NHS trusts and others were established and LAMP testing further rolled out. This offer has now expanded to over 70 trusts, with many trusts undertaking a mix of LFD and LAMP testing. As LAMP tests are processed by a laboratory, staff do not need to input their own results.

Appendix 2

This table shows the positivity rate of HCWs who reported test results over the 27-week evaluation period November 2020 to May 2021, and relates to the entire period.

Table A2. Summary of evaluation findings over the 27-week period November 2020 to May 2021 for the NHS healthcare workers who were reporting

Measure	Category	Tests registered: number	Staff registering a test: number	Staff registering a test: percentage	Positivity rate: percentage	Median tests: number
Total		10,447,900	908,460	73%		7
Gender	Female	8,603,660	5,369,760	68%	4.10%	8
	Male	2,006,310	1,266,210	58%	2.20%	7
	Other	980	540	n/a	4.70%	15
	Not known	340,320	209, 340	n/a	2.00%	3
Age band	Under 25	323,470	40,950	57%	4.60%	5
	25 to 34	1,828,310	193,950	61%	5.40%	6
	35 to 44	2,229,570	194,550	64%	4.60%	8
	45 to 54	2,864,210	217,080	64%	3.90%	10
	55 to 64	2,588,660	179,040	76%	3.30%	11
	65 and over	454,220	32,340	109%	2.70%	10
	Not known	159,460	50,560	n/a	1.50%	1
Ethnic group	Asian or Asian British	295,870	34,390	26%	5.40%	5
	Black or Black British	264, 990	29,340	37%	5.30%	5

Measure	Category	Tests registered: number	Staff registering a test: number	Staff registering a test: percentage	Positivity rate: percentage	Median tests: number
	Chinese	45,260	3,960	57%	4.70%	7
	Mixed	165,930	17,310	75%	4.00%	6
	White	6, 950, 790	550,490	57%	4.00%	9
	Any other	323,360	30,570	n/a	5.30%	7
	Not known	2, 401, 690	242,410	n/a	3.80%	6
Trust type	Acute	1,818, 170	133,760	70%	3.50%	7
	Ambulance	633,020	44,840	88%	3.80%	6
	Community provider trust	7,555,710	685,930	87%	4.00%	10
	Mental health	440,990	43,930	59%	7.50%	10
Region	East	1,040, 210	95, 410	79%	3.70%	6
	London	1,302,110	138,510	65%	3.80%	5
	Midlands	1,913,170	163,000	67%	3.20%	8
	North East and Yorkshire	1,839,100	135,610	62%	2.50%	10
	North West	1,324,040	126,270	63%	2.60%	5
	South East	1,929,960	156,780	90%	3.90%	9
	South West	1,099,310	92,890	73%	3.10%	8

Appendix 3

Table A3. Summary table of NHS staff headcount taken from NHS Digital Hospital and Community Health Services (HCHS) workforce statistics in England, March 2020

Measure	Category	NHS staff headcount: number	NHS staff headcount: percentage
Gender	Female	999,785	77%
	Mail	300,785	23%
Age band	under 25	71,344	5%
	25 to 34	320,072	25%
	35 to 44	303,806	23%
	45 to 54	339,140	26%
	55 to 64	236,619	18%
	65 and over	29,589	2%
Ethnic group	Asian or Asian British	132,099	10%
	Black or Black British	79,708	6%
	Chinese	6,971	1%
	Mixed	22,996	2%
	White	966,092	74%
	Any Other	31,585	2%
	Not known	13,125	1%
	Not stated	47,994	4%
Trust type	Acute	973,282	75%
	Ambulance	50,093	4%
	Community provider trust	51,791	4%
	Mental health	226,396	17%
Region	East	124,171	9%
	London	216,351	16%
	Midlands	247,626	19%
	North East and Yorkshire	221,106	17%
	North West	201,447	15%
	South East	179,003	14%
	South West	129,835	10%

Source: NHS Workforce Statistics, 2020

Appendix 4. LAMP evaluation findings (November 2020 to May 2021)

Background

Prior to the rollout of LFD asymptomatic testing, a different testing technology called Loop Mediated Isothermal Amplification (LAMP) had been previously piloted with asymptomatic HCWs in 5 acute NHS trusts from August 2020. LAMP testing continued in these trusts, with 2 more joining to make 7 trusts in total, running alongside LFD testing to complement NHSE's programme of asymptomatic testing.

By the end of the 27-week the evaluation period LAMP was available for asymptomatic testing at 7 acute NHS trusts. These trusts were situated in Norwich, Wolverhampton, Liverpool, Lancashire, Southampton, Basingstoke, and Exeter.

LAMP test results were reported daily by NHS trusts and fall into the following categories:

- positive
- negative
- void

Individual level test result data was not available meaning that it was not possible to break down the results by demographic characteristics.

It should be noted that while some people might have tested using both lateral flow and LAMP, it was not possible to link testing at an individual level due to lack of personal information for LAMP results.

Number of tests reported

The total number of tests processed up to 30 May 2021 was 231,410. These gave 218 positive results which is a positivity rate of 0.09% by test over the whole evaluation period. Positive cases peaked in January 2021 when they were 0.25% by test.

Data collection from the 7 trust sites commenced at different stages during the evaluation period, the date at which the trusts came online is summarised below along with the monthly number of tests processed by the trust.

Monthly tests of each LAMP trust site: total monthly tests reported

Trust	Data first collected	November 2020	December 2020	January 2021	February 2021	March 2021	April 2021	May 2021
Southampton	23 November 2020	795	1,817	2,834	2,800	4,049	2,976	2,170
Basingstoke	7 December 2020	N/A	51	307	497	957	2,547	5,011
Liverpool	18 January 2021	N/A	N/A	776	7,094	27,110	28,507	30,503
Lancashire	4 January 2021	N/A	N/A	5,259	7,816	11,053	9,838	14,597
Exeter	25 January 2021	N/A	N/A	40	197	760	1,900	2,484
Norwich	8 February 2021	N/A	N/A	N/A	426	1,398	1,034	2,599
Wolverhampton	18 January 2021	N/A	N/A	209	3,049	13,592	16,093	18,355

Summary of tests processed by NHS trusts, including total numbers of positives and voids

NHS trust	Total tests	Positive	Void	Negative	% Void	% Positive
Southampton	17,441	9	173	18,129	1%	0.05%
Exeter	5,381	2	43	6,258	1%	0.04%
Norwich	5,457	5	300	5,410	5%	0.09%
Liverpool	93,990	66	7,952	90,461	8%	0.07%
Lancashire	48,563	122	2,342	48,811	5%	0.25%
Basingstoke	9,280	7	16	9,901	0%	0.08%
Wolverhapmton	51,298	7	1,417	52,739	3%	0.01%
Totals	231,410	218	12,243	231,709	5.30%	0.09%

Participation in LAMP testing

We are not able to comment on the number of individual people who engaged in LAMP testing, or positivity per person tested as we have no related demographic data.

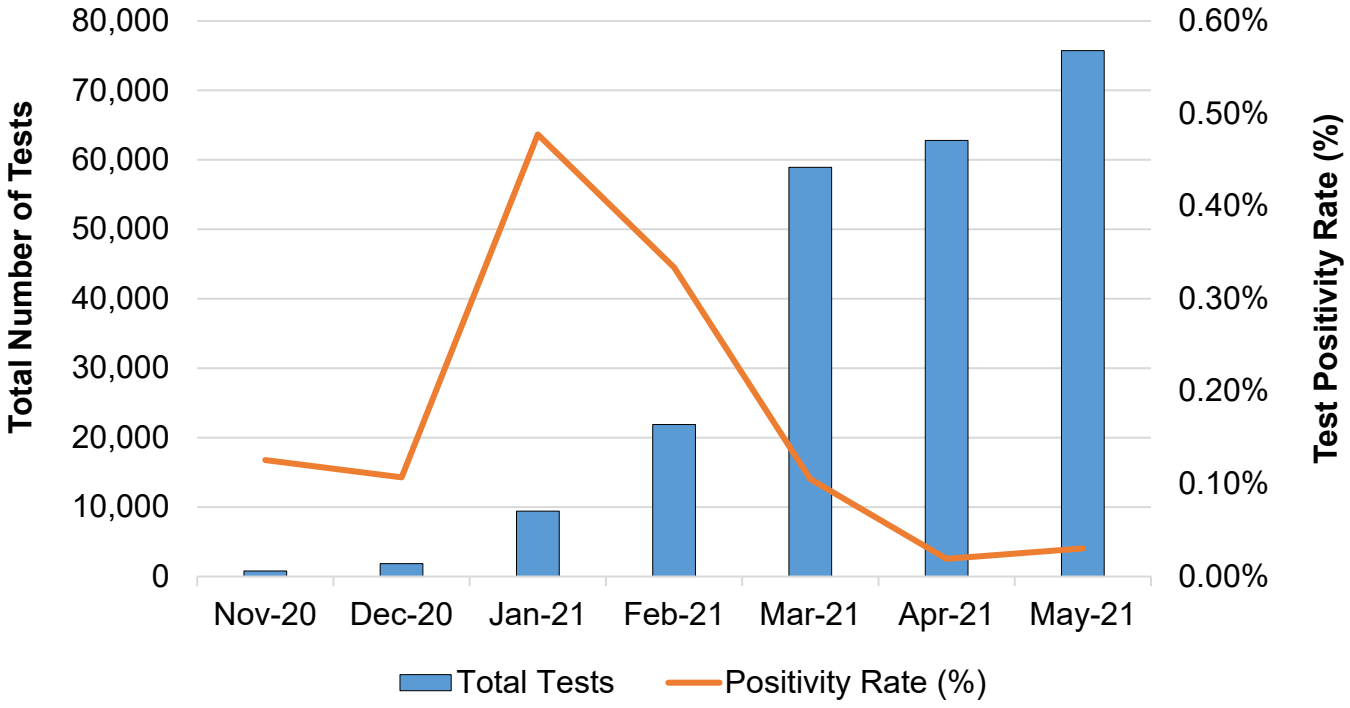
Pattern of positive results

The test positivity rate was 0.1% over the course of the entire evaluation period. Weekly and monthly LAMP results showed no clear pattern in the positivity rate of LAMP. The peak was observed in January 2021 (0.48%) and the positivity rate declined since then to 0.03% in May 2021.

Monthly LAMP tests reported data

Month	Total number of tests	Positives	Positivity rate (%)
November 2020	795	1	0.13%
December 2020	1,868	2	0.11%
January 2021	9,425	45	0.48%
February 2021	21,879	73	0.33%
March 2021	58,919	62	0.11%
April 2021	62,805	12	0.02%
May 2021	75,719	23	0.03%

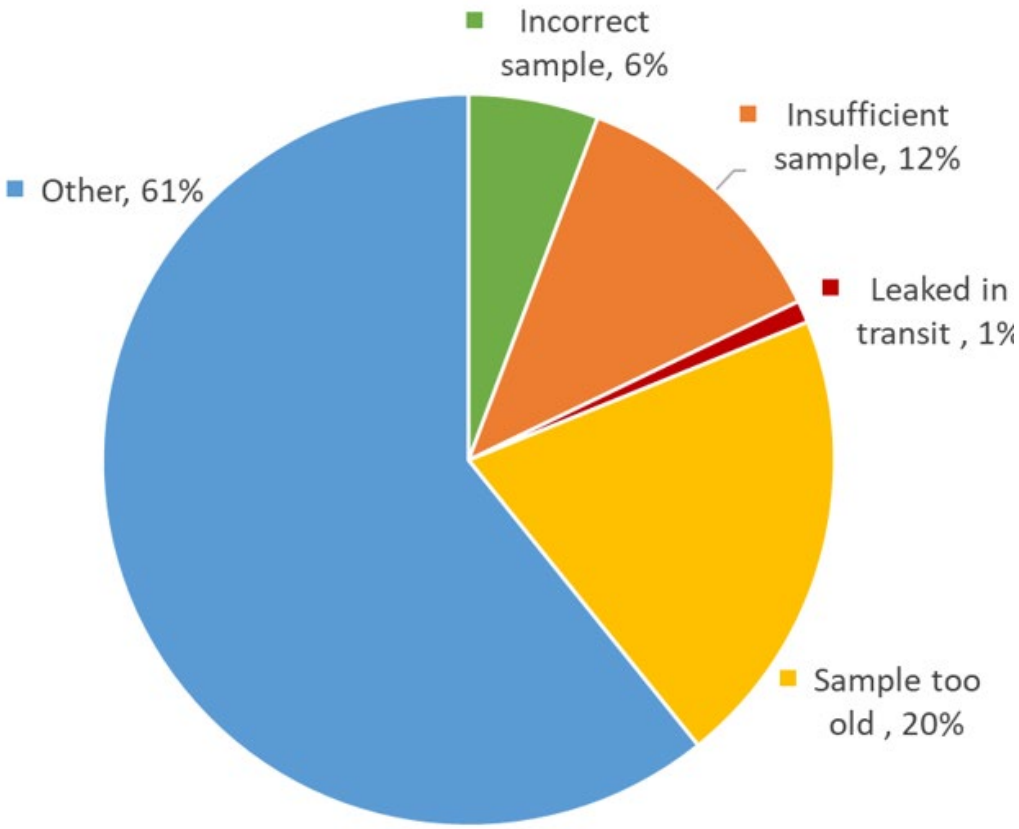
Figure 22. Number of LAMP results reported and positivity rate over time



Void results

There were over 12,000 results reported as void, which is 5.3% of all results reported (see Table 19). Where a reason was given, the greatest number of voids was due to the non-viability of sample due to its age. However, the largest proportion of all voids (61%) were listed as ‘other’ and we do not have any further information on whether the void was sample-related or assay-related.

Figure 23. Proportion of voids from LAMP samples



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