UK Health Security Agency

Mass asymptomatic testing for COVID-19 in schools, colleges and higher education institutions

Findings of 2 large scale asymptomatic testing interventions in winter of 2020 and spring of 2021

January 2024

Contents

Background

In the midst of the coronavirus pandemic, there was concern about the potential for infection to spread amongst children and young people attending schools, colleges and university to and then into more vulnerable groups in the wider community such as the elderly or immunocompromised. This spread could happen not only in education settings themselves but also during travel, external activities or at home.

Mass asymptomatic testing of children and young adults was considered an important tool in minimising disruption to education, and sat alongside other infection control measures.

Here, we consider 2 widespread uses of lateral flow devices (LFDs) for mass asymptomatic testing in education settings:

In Higher Education Institutions (HEIs) in late 2020, when the primary objective was to reduce the risk of transmission from students travelling home from university or college at the end of term for the winter break.

In secondary schools and further education colleges in spring 2021 to increase confidence among parents and staff for school pupils to return to on-site education; this use also included staff, but not pupils, in primary schools.

Mass asymptomatic testing in HEIs, winter 2020

In November 2020, just before the HEI winter break, the COVID-19 infection survey consistently showed that positivity rates were highest amongst teens and young adults (1). There was a perceived risk that students travelling home for the winter break (estimated to number around 370,000) would transmit infection to their relatives, including those who could be vulnerable. To mitigate this risk, HEIs became the first use case for lateral flow-based coronavirus (COVID-19) mass asymptomatic testing.

Mass asymptomatic testing in schools and colleges, spring 2021

Mass asymptomatic testing was then implemented on an even larger scale in spring 2021, as the Government had an imperative to ensure the safe return of pupils to on-site attendance at schools and further education colleges (2). For 2 weeks after their full physical reopening in March 2021 following national lockdown, secondary schools and colleges were advised to commence on-site testing with LFDs for all pupils. Pupils initially took their tests at asymptomatic test sites (ATSs), where they self-swabbed and a trained staff member conducted the test and read the result. Tests were repeated ideally at a 3 to 5 day interval for

pupils, with twice-weekly self-tests at home for staff. Pupils then moved on to home-based self-testing when the levels of self test stock available allowed this.

These testing interventions were the precursors to a level of mass testing in the UK which was one of the highest per capita in the world (3) and was considered a key tool to accelerating the easing of coronavirus restrictions.

Testing before returning home for winter break: higher education sector, November to December 2020

Background

In November 2020, the COVID-19 Infection Survey consistently showed that positivity rates were highest amongst teens and young adults. Guidance for symptomatic individuals and there contacts, including symptomatic PCR testing, was in place and accessible to all. Data from earlier months of the survey suggested that around a third or fewer of all people with a positive result reported symptoms at the time of testing for the survey, suggesting substantial numbers of asymptomatic or presymptomatic cases (4, 5). Although the risk of serious illness amongst students and teens was itself low, there was a risk that students travelling home for the 2020 winter break would transmit infection to their relatives, some of whom may be more vulnerable (6). To mitigate this risk, HEIs became the first use case for LFD-based COVID-19 mass asymptomatic testing.

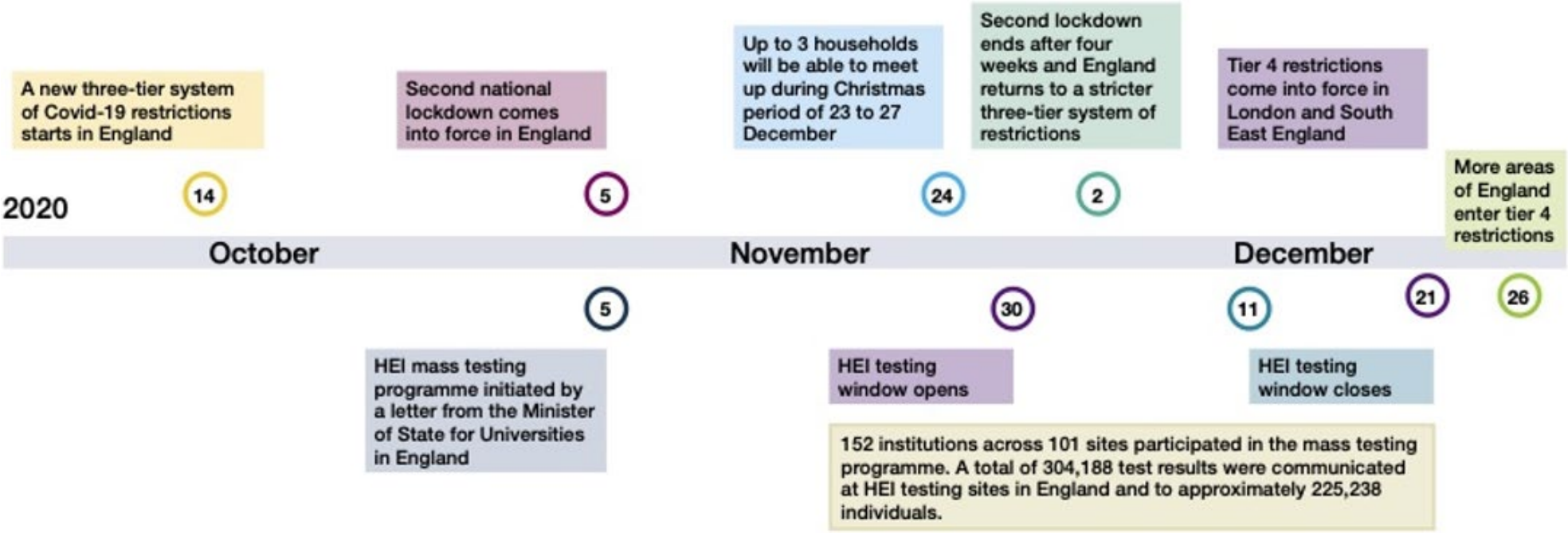
There were around 2.3 million students studying at HEIs in England (7). Despite the fact that many of the students who would normally have been on campus were already living at home due to restrictions brought in to try to reduce the spread of COVID-19, it was expected that there would still be a mass movement of students from universities back to their communities. This had the potential to transmit the virus both nationally and also internationally due to the large international contingent of students in the UK, (605,130 in 2020 to 2021) (8) both during transit and once they arrived home.

Short feasibility pilots were run at De Montfort University Leicester, University of Sussex and Queens University Belfast, which all showed it was operationally feasible to run mass asymptomatic testing in HEIs. After this, the national roll-out began on 5 November 2020 in anticipation of the return home of students at the end of term.

Primary objective of testing

Government policy requested HEIs to provide a facility for their students to get tested for COVID-19 using Innova LFDs. At this time, self-test LFDs were under the process of obtaining regulatory approval and so use of assisted test sites was the only option. The objective was to detect and isolate asymptomatic or pre-symptomatic cases.

Figure 1. Timeline of UK coronavirus lockdowns and mass testing programme in higher education institutions, October to December 2020



Text version of Figure 1

14 October 2020: A new 3-tier system of COVID-19 restrictions starts in England.

5 October 2020: Second national lockdown comes into force in England. HEI mass testing programme initiated by a letter from the Minister of State for Universities in England.

24 November 2020: Up to 3 households will be able to meet up during Chrismas period of 23 to 27 December.

30 November 2020: HEI testing window opens.

2 December 2020: Second lockdown ends after 4 weeks and England returns to a stricter 3-tier system of restrictions.

11 December 2020: HEI testing window closes.

21 December 2020: Tier 4 restrictions come into force in London and the South East.

26 December 2020: More areas of England enter tier 4 restrictions.

152 institutions across 101 sites participated in the mass testing programme. A total of 304,188 test results were communicated at HEI testing sites in England and to approximately 225,238 individuals.

End of text version of Figure 1

The intervention

The testing window was positioned between 30 November and 11 December (see Figure 1). Timing of the programme was designed to overlap with the student travel window (3 to 9 December). These windows were chosen so that students identified as positive for COVID-19 had time to complete self-isolation prior to returning home for winter break. Some HEIs finished testing at the end of the travel window (9 December) and others continued until the end of that week (11 December) so that the testing option was still available to students where necessary.

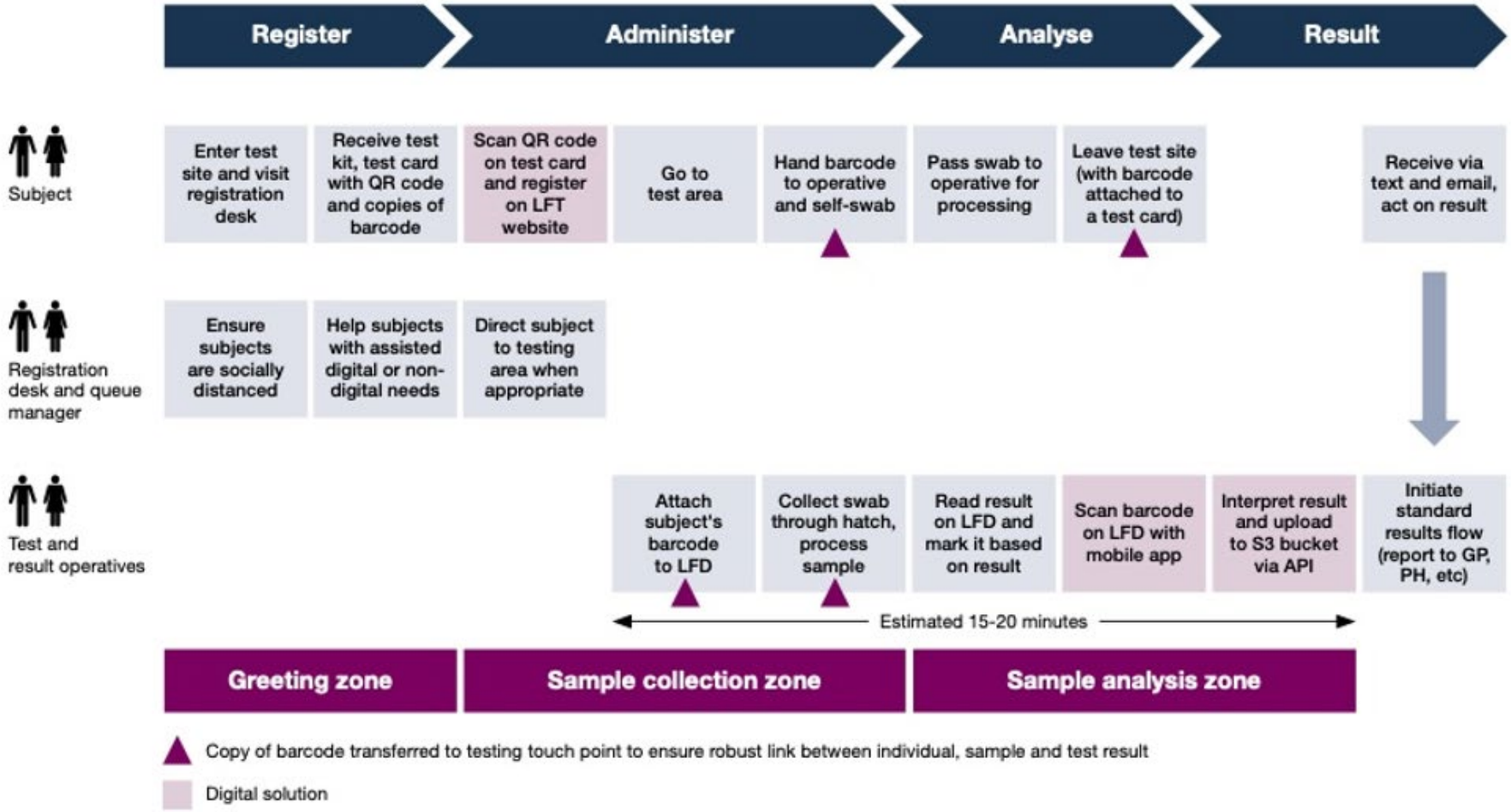
The data analysis presented below covers a wider period of between 27 November to 20 December to allow for local variation in delivery and students who travelled later.

In England, 101 HEIs participated in testing and 156 testing sites were established. HEIs in Scotland, Wales and Northern Ireland also participated but are not included in this evaluation.

Staff and students were provided with 2 Innova LFD tests to be taken 3 to 4 days apart at a dedicated ATS where they self-swabbed and a trained staff member conducted the test and interpreted the result. Quality assurance checks and incident management processes were in place throughout. Individuals who tested positive were advised to seek a confirmatory PCR, and they and their close contacts were required to self-isolate for 10 days as per UK government guidelines at the time. If the confirmatory PCR test was positive, they had to continue their self-isolation for the full 10-day period. If the confirmatory PCR was negative, they were able to break the self-isolation to travel home from university within the next 24 hours where they could then finish their self-isolation (part of the safe travel policy).

The testing process is outlined in Figure 2.

Figure 2. On-site LFD testing process at HEIs



Text version of Figure 2. On-site LFD testing process at HEIs

Figure 2 describes the on-site LFD testing process at HEIs, starting with test registration and progressing through administration, analysis and results.

The top row describes the onsite journey for individuals starts with registration. Subjects attend the registration desk upon entering the site to receive the test kit, a test card with QR code and copies of the barcode. They then scan the QR code and register on the LFT website, then go the test area for test administration. Following this, subjects hand the barcode to the operative and self-swab. After self-swabbing, subjects pass the swab to the operative for processing and leave the test site with the test barcodes attached to the test card. The subject receives their results via text and email.

The middle row describes the roles of the registration desk and the queue manager. During registration, these staff ensure that subjects are socially distanced, help subjects with assisted digital or non-digital needs, and direct subjects to the testing area when the time comes to administer the test.

The bottom row describes the roles of the test and result operatives in administering and analysis of the test, and in interpretation of the test results. The test and result operatives help subjects attach their barcodes to the LFDs, collect the swabs through the hatch once the subject has swabbed, in order to process samples. They then read the LFD result and mark it, based on the result, following which they scan the barcode with the mobile app and upload the result to the S3 bucket via the API. They then initiate the standard results flow which includes reporting to GP, PH bodies and similar.

End of text version of Figure 2

Findings

Uptake

The target population for winter testing was defined as HEI students living away from home intending to travel home for the winter break. The calculation of uptake was based on pre-pandemic HEI numbers adjusted for students not present-in-person through distance learning, study abroad and off-campus placement, giving an estimate of about 370,000 eligible participants in England (for details on how this estimate was calculated see Appendix A.). In total, 225,238 individuals took part in testing, an uptake of 61%. LFD testing uptake was similar for male and female students but varied by:

- Age: uptake was 84% for students aged 20 years or younger and 46% for individuals over 20
- Ethnicity: uptake was lower for black students than any other ethnic group although missing ethnicity data limits confidence in this interpretation

LFD performance

There were 304,188 tests were taken by 225,238 individuals as part of the programme. Two-thirds of these tested via LFD once, and one-third tested twice or more.

A total of 977 positive cases were found through asymptomatic testing with LFD, giving a positivity rate of 0.4%. These were cases that would otherwise have been undetected or detected later.

LFD testing succeeded in finding the positive cases that were potentially the most infectious. Infectiousness is linked to the viral concentration of samples and the viral concentration can be calculated from the cycle threshold (Ct) value of the PCR result. Only a subset of the LFD positives could be matched to a confirmatory PCR (228)[1]. Up to 64% of these showed high viral concentrations (over 1.2 million viral copies per millilitre (mL))[2] suggesting these cases had the potential to be highly infectious.[3] The mass testing programme was for asymptomatic individuals and at the time, government policy was to limit PCR testing to people who self-declared as symptomatic. As such, these cases were highly likely asymptomatic and unlikely to

[1] Confirmatory PCR data is not directly linked to LFD data. It is matched through different databases and as such there is potential to miss some confirmatory PCRs.
[2] Cycle thresholds (Ct) at different laboratories cannot be compared, however, they can be converted into viral concentration using specific formulae from the laboratory where the PCR test was processed (see (9) for the conversion formulae) and these viral concentrations can be compared.
[3] High viral concentration has been used as a proxy for infectiousness. Although there is no established viral concentration above which a case will be transmissible and below which it will not, 1 million copies per mL has been used as a proxy for infectiousness (10).

have been identified through other routes unless or until the individual developed symptoms by which time they may already have transmitted the virus to others.

The evaluation also showed that LFD tests were effective in identifying different variants of COVID-19. Of the 228 LFD positives with a positive confirmatory PCR test result, 29% (67) were S-gene negative (indicative of the Alpha variant (B.1.1.7)).

Operations

The ATS model of testing was in the process of being refined when the HEI winter testing initiative was introduced. Of the 156 HEI testing sites in the pilot, 58 responded to requests to participate in evaluation interviews. Due to time constraints, not all could be included in the sample. In total, 29 telephone/online interviews were conducted with university representatives responsible for delivering the testing programme and one site visit took place between 4 and 11 December 2020.

HEIs reported that they had found the speed of design and implementation of the programme challenging. Despite this, they felt that they had been able to deliver testing to students in a satisfactory way. Good communication between HEIs and other bodies involved in delivering testing and in providing information to students, was seen as essential to the success of the programme. Many HEIs have highly capable marketing and communications teams, alert to the strategies best suited to connecting with their students. A multi-channel approach to communications informing students of the testing programme was deployed. Core messages that HEIs used embraced 3 main themes: ‘get home safe’, ‘protect family and friends’, and ‘keep safe and protect yourself’.

There were logistical challenges in setting up and running testing sites, including costs and staffing, along with delivery of materials to enable testing to commence on time. Training resources were a notable success. HEIs reported that online training materials provided by NHS Test and Trace were viewed as being of good quality and were pitched at a level that was suitable for non-medically trained personnel.

Student attitudes to testing

HEI programme leads were asked to forward access to an online survey to all students at their institution. There were 2,214 completed responses across 37 universities, but a small number of institutions made up a large proportion of the responses with some institutions providing few or no responses; its representativeness is therefore uncertain. The survey aimed to canvass a range of views on barriers and incentives to take part in testing, from those not yet tested or undecided, along with students who had opted not to test, as well as those who had.

Of the respondents, 71% had taken a COVID-19 test on or after 30 November 2020 during the testing window. Of these, student satisfaction with testing was high (93%) and the intention to

repeat test on post-winter break return was high at 75%. Over 85% of students who tested reported that it was easy to locate relevant information about testing and to queue safely to take the test, site accessibility was good, and it was easy to understand test results.

Of the 6 options available, the most frequently selected reasons for taking a test were as follows:

- to protect themselves and others by reducing the spread (41%, 582)
- as a way to return home for the winter break (40%, 566)
- to give peace of mind (12%, 177)

Of those who had not been tested, 25% said they planned to get a test soon. The other main reasons given for not taking up testing were:

- it did not fit in with their schedule (20%)
- they were concerned it might take a test away from someone that needed it (19%)
- they had had a test through another route (19%)

Students also voiced concerns about the efficacy of LFDs and concerns about the impact on their academic work and life if they tested positive. Below are some of their comments and concerns from the student survey:

“The test is gross and I have not had symptoms.”

“Wasn’t inclusive of students training to be teachers, didn’t fit in with schedule of trainee teachers.”

“Already had COVID and statistically impossible to get it again <0.005%.”

“I’d rather travel home to isolate knowing I could receive safe distanced help of my family and not risk anyone in my flat contacting a surface I have touched or passing me in the corridor.”

Testing in schools and colleges on return to in-person education: 1 March to 4 April 2021

Background

As part of the Government's strategy for managing the COVID-19 pandemic, the asymptomatic testing programme (accompanied by contact tracing for positive cases and self-isolation for positive cases and their contacts) was initiated for staff and pupils in education settings in England from January 2021. The aim was to keep pupils in face-to-face education following a period of national lockdown which required education settings to restrict attendance for most pupils. Throughout this lockdown, schools had been open for children of key workers and children identified as 'vulnerable' such as those with recognised safeguarding needs. There was also discretionary provision for children with special education needs and disabilities (SEND) with and without an education, health and care (EHC) plan.

In March 2021, pupils tested on-site at ATSs within their educational settings, staggered over a period of 2 weeks before transitioning to home testing. Staff received access to home testing over the course of the first quarter of the year, with primary school staff closely followed by secondary and further education staff in January and then nursery staff in March. Additional measures in place included the use of segmentation (known as 'bubbles') to minimise mixing between pupils and teachers, staggered start and finish times, social distancing in common areas, increased ventilation, good hygiene practices and face coverings. In addition, PCR testing for individuals developing symptoms was also available for individuals of all ages during this period via national COVID-19 testing infrastructure with self isolation required of positive cases and their contacts. These measures are not considered as part of this evaluation.

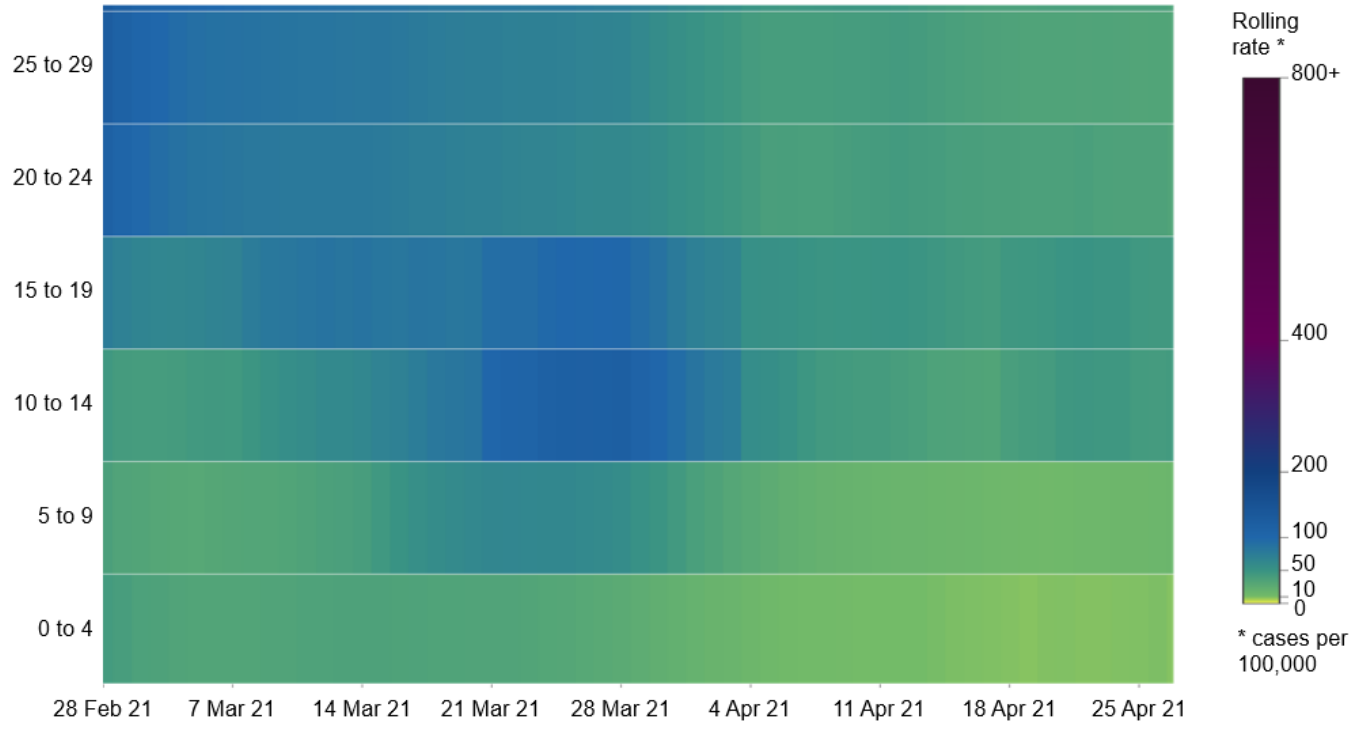
Positive test results identified at an ATS did not initially require a confirmatory PCR but this was reinstated from 31 March 2021 due to the low prevalence of COVID-19. However, positive LFD tests taken at home did require a confirmatory PCR. A positive PCR meant an individual would be contact traced and was required to self-isolate for 10 days. Individuals who had come into close contact with a positive case were also required to self-isolate.

Here, we present how mass asymptomatic testing worked in this setting, focusing on a 5-week period from 1 March 2021 to 4 April 2021. This is the period after education settings reopened for full in-person attendance to all pupils (referred to hereafter as 'full school reopening' for simplicity). This gives a snapshot of the testing programme including testing via ATS taken at a school or college. This evaluation focuses primarily on staff and pupils in secondary schools and further education (FE), but also refers to staff in nurseries, maintained nursery schools, schools-based nurseries, and primary schools at various points. The evaluation does not include data from private, voluntary and independent nurseries, specialist settings, children's social care settings or higher education.

Ahead of schools reopening on 8 March, the case rate in 15 to 19 year olds stood at 68.8 per 100,000 (7 March). On 18 March it was 84.6. Similar trends were seen for 10 to 14 year olds (44.5 to 80.6) and 5 to 9 year olds (31.8 to 57.9), but the rate fell in every other adult age group over the same period (11). The rise in case rates in younger age groups was largely attributed to the additional testing activity, with data from the ONS COVID-19 Infection Survey suggesting the possibility of only a small rise that would not explain the difference in case rates (11).

Figure 3 shows a heatmap representation of COVID-19 test results for the period of March and most of April 2021 for age groups in 5-year bands up to the age of 29. The age groups being tested in this schools-based mass testing initiative fell into the 10 to 14 and 15 to 19 bands. The older and younger bands have been included for comparison. The trend in increased positive results can be seen to start in the week commencing (w/c) 7 March and continues to w/c 4 April after which the rate of positive results falls back to the around the same for all the age bands. It is accompanied by a smaller, shorter-lived, rise in the rate of positive results in the 5 to 9 age band starting in w/c 14 March and falling away again by w/c 28 March. This could be attributable to be a younger sibling effect within households, as routine asymptomatic testing did not extend to primary school age children.

Figure 3 Heatmap of COVID-19 cases by age group in March to April 2021



Source: Cases in England | Coronavirus in the UK

Objectives

The clinical and public health objectives of the asymptomatic testing programme were:

- finding those with the virus and isolating them quickly to break chains of transmission, ensuring and promoting the wellbeing of pupils and staff
- broader societal and educational benefits such as increasing public confidence in going to educational settings and reducing lost face-to-face learning
- minimising self-isolation of pupils and allowing parents and carers to be economically active
- keeping schools open for face-to-face learning which is seen as key to developing the skills of the future workforce

Main findings

Implementation

A slightly longer period was examined here (4 January to 4 April 2021) due to difficulties in associating tests delivered with those registered, and lack of data on site inventories. It was not possible to reliably distinguish primary schools from nurseries in the data so they were included together in this analysis.

During the period 4 January to 4 April, 27.4 million test results were reported (in school or home testing) with 21.8 million results reported during the evaluation period of 1 March to 4 April (see Table 1). At primary schools and nurseries testing kits were only given out to staff, whereas in secondary schools and FE, testing kits were given to both staff and pupils.

Table 1. Test kits registered by setting

Settings	Number of settings	Test kits registered
Primary and nursery	17,951	6,621,115
Secondary and further education	6,886	20,793,590
Total	24,837	27,414,705

Data published by the National Audit Office (NAO) indicates registered tests as a proportion of tests dispatched for educational settings is amongst the highest of all sectors (second only to community testing) (12).

Reported participation

Assuming all eligible individuals took 2 tests per week the average percentage of tests reported over the period were:

- 27% for secondary school pupils, and 8% for college pupils
- for staff, this was 43% in primary schools, 34% for secondary schools, and 15% for colleges

The participation rate of testing declined over time (see Table 2), noticeably following the transition from testing onsite to self-test at home. For example, the estimated participation in secondary school pupils reached a peak of 41% in the week commencing 15 March and reduced to 18% for the week commencing 29 March. Participation findings are only based on tests that were reported, the move to self-test at home put the onus on the individual to report results. There is likely to be underreporting, leading to participation estimates appearing lower, with user research indicating individuals were less likely to report negative results.

Table 2. Staff and pupil participation rates for state funded schools each week (w/c=week commencing)

Group	w/c 01/03/21 (%)	w/c 08/03/21 (%)	w/c 15/03/21 (%)	w/c 22/03/21 (%)	w/c 29/03/21 (%)	Overall participation (%)
Primary – staff	44	47	47	44	33	43
Secondary – staff	16	41	43	40	28	34
Secondary – pupil	9	38	41	30	18	27
Colleges – staff	5	18	20	19	13	15
College – pupil	<1	5	8	11	7	6

The most detailed data on self-reported participation available for the evaluation period is from Wave 8 (March) of the Parent and Pupil Panel (13). Reported COVID-19 test participation in the month of the survey is shown in Table 2 and is split across ATS and home-testing.

Table 3. Summary of survey evidence on self-reported test participation, split into test participation overall (ATS and home) and home-test LFDs specifically

Table 3a. Self-reported test participation (ATS or home)

	Fieldwork	Source
91% of secondary age pupils reported having tested in the last 7 days	22 to 26 March	PPP, Wave 8
92% of parents of secondary age pupils reported children had tested in the last 7 days	22 to 26 March	PPP, Wave 8
68% of parents of secondary age pupils reported children had tested ever (ATS or home LFD)	24 to 28 March	OPN (9)

Table 3b. Self-reported home test participation

	Fieldwork	Source
67% of pupils reported having tested at home in the last 7 days	22 to 26 March	PPP, Wave 8
68% of parents of secondary age pupils reported children had tested at home in the last 7 days	22 to 26 March	PPP, Wave 8

Some caution should be taken in interpreting the self-reported home test figures above (see Table 3) as a stable proxy of overall home testing uptake. These data are a point estimate in a

time series of transition between ATS and home testing. Whilst most schools were reporting they had primarily shifted to home testing by the time of this survey, ATS was still being used disproportionately in some school subgroups. As such, the data presented in Table 3 likely includes a (small) effect of some pupils who would not yet have transitioned to home testing, in addition to those choosing to participate or refusing to participate to home testing.

Public health impact

Out of the 21,808,955 reported tests, there were 19,325 positive for SARS-CoV-2 (a 0.09% positivity rate across all education settings).

The ONS COVID-19 Infection Survey (14) on 5 March 2021 estimated that 0.31% or approximately 1 in 220 of the population had COVID-19 in the week ending 27 February 2021. If this rate is assumed to apply in education settings then the asymptomatic testing programme identified around 29% of cases. Although it appears that mass asymptomatic testing found or reported fewer cases than were present in the population, mass testing with LFDs did not include symptomatic individuals who were able to access freely provided PCR testing and were not included in this evaluation.

As stated above, confirmatory PCR was not recommended for positive cases identified at ATSs until 31 March; LFD tests taken at home which returned a positive result did require a confirmatory PCR. During the period to 4 April 2021, there were 5,110 LFD positives (1,367 assisted testing and 3,743 self-testing) that were matched with a confirmatory PCR taken within 3 days of the LFD test. After de-duplication, it was found that 4,954 pupils took a confirmatory PCR which revealed that 3,181 were true positive and 1,737 were false positive. For this group, we estimated approximately 4,000 school days were missed due to a false positive result (around 2 days per pupil who had a false positive test).[4]

There were 4,525 pupils with a positive LFD who, according to the matching approach used, did not take a confirmatory PCR. It was estimated that up to 1,600 of these pupils may have isolated for the full period when they did not have the virus. For this group, it was estimated that at least 9,528 school days and at most 12,704 school days were missed.

Modelling was undertaken (see Appendix B for details of the model) to contextualise the data and examine what happened in comparison to what may have been expected. It found evidence of differential uptake in reported testing, which may indicate increased vulnerability of settings with particular pupil demographics to higher COVID-19 rates even with asymptomatic testing in place. Schools which recorded relatively fewer pupil tests tended to have one of more of the following characteristics: a higher proportion of free school meals (FSM) eligible pupils, a higher

[4] This follows the assumption that the day of LFD test with positive result and the day the negative PCR result received were both missed if they did not fall on the weekend. Number of school days missed was estimated for 1,735 students.

proportion of pupils from ethnic minority backgrounds, lower Ofsted grades, and tended to be located in urban areas.

Positivity rates were higher in schools which tended to have one or more of the following characteristics: they were in areas with higher community COVID-19 rates, had more FSM pupils, and more pupils from ethnic minority backgrounds.

Looking at wider mobility patterns, the reopening of schools and colleges coincided with, and may have accelerated, an upward trend in mobility due to journeys to and from school. This uplift in mobility also includes different categories of mobility such as residential, workplace, retail and grocery.

Simulation modelling (see Appendix B for more details) was used to project a number of different testing scenarios, using real-world data as inputs. We are not able to disaggregate data on these groups from the total tests recorded as part of the testing programme. This will have increased our calculations of uptake and also had some impact on the demographic breakdown of those that were tested. Again, because we were not able to quantify the effect, no adjustment has been made). The modelling provided various conclusions:

Firstly, relatively low testing participation rates inevitably limited the potential impact of asymptomatic mass testing.

Secondly, had the asymptomatic testing programme not been in place, while absences due to the requirement for self isolation would have reduced by 31% to 41%, this would have been due to failure to identify infected pupils and their contacts for whom self-isolation would have been the appropriate measure. It is estimated that the testing programme prevented around 5,000 to 8,000 infections amongst secondary school children during this period, which could have resulted in an increased infection rate of around 13% to 23%. Over a longer period, modelling suggested a reduction in self isolation absence rates due to the effectiveness of the testing programme at preventing transmissions.

Finally, asymptomatic testing for COVID-19 accompanied by self-isolation and contact tracing may help suppress infections in schools in different future-scenarios, which would have to be considered on an individual basis and in combination. For example, if prevalence were higher, if the R number in the community was above 1, if the wider system of controls was relaxed, if there were a more infectious variant in circulation, or if seasonal effects led to increased transmission risk.

Did testing change behaviour?

To assess the impact of testing on behaviour, questions were added to the Parent and Pupil Panel, a regular online omnibus survey from the Department for Education (DfE) of secondary school pupils and parents of primary and secondary school pupils.

The questions added to the survey were to assess the extent to which pupils were observing the behaviours required during the pandemic. Comparison was drawn between those who reported taking a COVID-19 test (ATS or home) in the preceding 7 days and who had not received a positive result (n=1,364) versus those who reported having not taken a test at all (n=145).

The survey found that:

- more pupils who reported testing negative for COVID-19 also reported attending school at least once in the preceding 7 days (99%), compared with those who had not taken a COVID-19 test (82%)
- more of the test-negative group reported attending school most days in the preceding week (92%), compared with those who had not taken a COVID-19 test (63%)
- more pupils who reported testing negative for COVID-19 also reported spending time outdoors with others from outside of their household at least once in the preceding 7 days (53%), compared with those who had not taken a COVID-19 test (38%)
- for other social behaviours, such as visiting shops or spending time indoors with people not from their household, there were no notable differences in reported activity between pupils who reported testing negative for COVID-19 compared to those who had not taken a COVID-19 test

These results should be treated with caution since it is likely that at least some of the effect on reported social activities is a product of factors intercorrelated with COVID-19 testing uptake, rather than driven by test results.

Experiences of testing

Both parents and pupils reported that the testing programme made them more confident to attend school in person. Being regularly tested for COVID-19 made 46% of pupils feel much more confident about returning to school, and 41% reported that it made them a little more confident (87% more confident in aggregate).[5] Similarly, large majorities of both pupils and parents were confident that staff and pupil testing would mean schools or colleges could remain open: 83% of parents and 84% of secondary pupils agreed.[6] However, it is not possible to link rising confidence to testing specifically due to the changing policy environment across the reporting period (such as several non-pharmaceutical interventions including face coverings in schools).

Schools reported finding site-based delivery of testing challenging. The shift to home-testing addressed some of the most pressing difficulties even though there was a decline in reporting rates following the move from ATS to home testing.

[5] The scale used for these questions did not include a neutral midpoint for respondents to state that testing had neither a positive nor a negative impact on their confidence, although it did include a ‘don’t know’ option (5% of pupils indicated ‘don’t know’).
[6] Agreed = sum of ‘tend to agree’ and ‘strongly agree’.

Self-reported testing participation was lower where the pupil demographic had more vulnerable and more deprived groups, and among groups with more complex educational needs. These results are in accordance with analysis of the testing data alongside setting data, although self-reported measures of testing participation are much higher than the test results returned would suggest.

Discomfort and potential inaccuracy of testing (false positives and negatives) have been the most frequently reported concerns about testing from pupils.

Conclusions

These 2 evaluations show that it was possible to set up asymptomatic testing in schools and universities quickly during the COVID-19 pandemic and that a large number of pupils and students took part.

Analysis of mass asymptomatic testing in education settings in winter of 2020 and spring of 2021 presented in this report suggests there was not a substantial increase in infections amongst the populations of schools, colleges and universities. Testing of students, pupils and staff had the potential to reduce the spread of infection. A corollary of testing appears to be an increase in non-attendance in person at school in March and April 2021 due to self-isolation of both pupils who tested positive and their close contacts, however, modelling suggests that testing over a longer period would reduce transmissions and therefore lower these absence levels. In August 2021, policy on self-isolation changed and only confirmed cases were required to isolate (15). This change in policy came at a time of growing confidence in the impact of the vaccination programme to greatly reduce hospitalisation and death and had the effect of mitigating this disbenefit; reducing non-attendance in school due to self-isolation. In December 2021 in the wake of the Omicron variant becoming dominant, the policy of daily contact testing (16) was introduced which enabled eligible contacts including all children to test on a daily basis rather than self-isolate.

Survey data in schools and colleges found that parents and pupils felt more confident to attend school due to testing and that those who tested negative were more likely to attend school than those who did not test at all. This suggests that mass testing was an enabler to pupils to return to school and feel safe about doing so.

Asymptomatic testing in educational settings comes with costs as well as benefits. The more pupils that participate in testing, the more infections will be correctly detected with benefits for public health, but also more false positives will occur (and therefore unnecessarily lost face-to-face schooling). Positive cases found also means more absences from school, if following a policy of isolation of infected people and their contacts.

A policy that focuses on areas with high prevalence could help maximise the effectiveness of testing, as it may have greater potential to find infections and reduce transmission. There may also be benefits in focused support to schools that seem less able to implement testing (for example, those with a high proportion of pupils receiving FSM and a high proportion of ethnic minority pupils).

Analyses are based on the pandemic context before Easter 2021 (and before the outbreak of the Delta variant) and might not be the same if the wider context had changed with regards to infections in the community and variants of concern.

References

1. The Office for National Statistics (ONS). 'COVID-19 Infection Survey: characteristics of people testing positive for COVID-19 in England and antibody data for the UK: November 2020'
2. 'COVID-19 response spring 2021 (summary)'
3. Our World in Data. 'Total COVID-19 tests per 1,000 people' (2020)
4. ONS. 'Coronavirus (COVID-19) Infection Survey: characteristics of people testing positive for COVID-19 in England, August 2020'
5. ONS.'Coronavirus (COVID-19) Infection Survey: characteristics of people testing positive for COVID-19 in England: October 2020'
6. Scientific Advisory Group for Emergencies. 'Principles for managing SARS-CoV-2 transmission associated with higher education' (2020.)
7. Higher Education Statistics Agency. 'Who's studying in HE?' (2023)
8. Universities UK. 'International Facts and Figures 2022' (2022)
9. UKHSA. 'Evaluation of lateral flow device performance within the National Testing Programme: 8 November 2020 to 21 March 2022' (2022)
10. Lennard Y, Lee W, SRMPACCA. 'Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infectivity by viral load, S gene variants and demographic factors, and the utility of lateral flow devices to prevent transmission.' Clinical Infectious Diseases
11. ONS. 'Coronavirus (COVID-19) Infection Survey, UK'
12. The National Audit Office. 'Test and Trace in England: progress update' (2021)
13. Department for Education. 'Parent and pupil panel: omnibus surveys' (2021)
14. ONS. 'Coronavirus (COVID-19) Infection Survey, UK: 5 March 2021'
15. Department of Health and Social Care (DHSC). 'Self-isolation removed for double-jabbed close contacts from 16 August' (2021)
16. DHSC. 'Daily rapid testing for COVID-19 contacts launches this week' (2021)

Appendix A. Estimating the HEI target population for testing

We have estimated the target population for the testing to understand the uptake and effectiveness of the intervention.

The amounts of face-to-face learning varied in different HEIs from October to December 2020. Furthermore, the precise location of many students was often unknown or whether they still resided on campus or had moved to other accommodation. Data on pre-pandemic student numbers were drawn from HESA estimates, supplemented by information from Department for Education (DfE) sources, the HEI Testing Online Student Survey, and the Office for National Statistics (ONS) Student COVID-19 Insights Survey (SCIS).[7]

Calculating the target winter testing population required a number of steps. We started with the total student population of 2,076,465 for England academic year 2019 to 2020 provided by HESA, followed by:

- subtracting distance learners and students studying abroad[8]
- including all students living away from home in winter 2020[9]
- taking the percentage of these (56% from SCIS, November 2020) who said they intended to travel home (main target population for testing)
- removing the percentage on placement off-campus (6% from SCIS, November 2020)
- removing students who said they were testing elsewhere (20% from HEI online survey)
- adjusting for 20% of students estimated as unlikely to test because of previous or assumed prior COVID-19 infection:
    - those reporting prior or testing positive previously (18% to 19% from SCIS, November 2020)
    - or who had antibodies indicating prior COVID-19 infection: a cross-sectional survey conducted from 2 to 11 December 2020 across 5 universities in England in 2,905 students aged 25 years and under found COVID-19 seroprevalence was 17.8% (95%CI, 16.5 to 19.3%), and reached almost 50% in students living in halls of residence. As students had not yet been included in the vaccination programme, their antibodies can be assumed to derive from previous infection. Not all would have been aware of their infection status, but beliefs that they had already been infected with COVID-19 could plausibly account for up to 20% of non-uptake

[7] Coronavirus and higher education students - Office for National Statistics
[8] 'Coronavirus (COVID-19) Reporting in Higher Education Providers: methodology'. Estimate of number of students eligible to return to in-person teaching.
[9] HESA Chart 4. Full-time and sandwich students by term-time accommodation 2014/2015 to 2019/2020.

The above calculation gave a final estimate of 368,156 eligible potential participants in England, which was 17.7% of the total estimated pre-pandemic student population. Demographic breakdowns (for gender, age, and ethnicity) were based on the full pre-pandemic student population, on the assumption of similarity with the target population.

Data from SCIS showed that, in November 2020, only 26% of students with mainly class or lab-based learning reported face-to-face attendance in the previous week. This is likely to have translated into a reduction in those present for HEI testing, and therefore lead to lower calculations of uptake. However, the real-world implications of this effect were difficult to quantify, so no adjustment was made for this factor.

Others, who were not in the target population described above, were also tested as part of the programme. These groups include staff and students living at home and commuting from there to an HEI.

We are not able to disaggregate data on these groups from the total tests recorded as part of the testing programme. This will have increased our calculations of uptake and also had some impact on the demographic breakdown of those that were tested. Again, because we were not able to quantify the effect, no adjustment has been made.

Appendix B. Modelling for testing in education settings, March to April 2021

Summary of 2-step modelling process

Calibration

The reason this phase is needed is that some of the input parameters are relatively uncertain, such as the average transmission risk per in-school contact, or the extent to which pupils' behaviour becomes more risky after receiving a negative test result. To help choose a reasonable set of values for these parameters, the model is run many times, with different combinations of inputs each time. For each input parameter combination, projections for prevalence and absence rates amongst pupils over the course of the simulation are created. These projections are then compared to the actual observed data (for example, from the ONS Covid Infection survey, and schools' management information data) and choose the sets of input parameters that give the best fit to the real-world observed data between 8th March and the Easter holidays. In the end, the best 22 sets of parameters were chosen, to provide 22 simulations where asymptomatic testing is turned on, and 22 where it is turned off.

Evaluation

Once reasonable sets of input parameters for the model, have been obtained the mass LFD testing functionality is 'turned off'. By holding everything else constant, it can therefore be projected that a reasonable counterfactual for what might have happened to prevalence and absence if no asymptomatic testing had occurred, but if all other independent factors had remained the same (including PCR testing for symptomatic cases, isolation of 'bubbles' of pupils when a case is confirmed and so on). The counterfactual simulations to the 'testing' simulations are then compared and make inferences about the impact of testing from those comparisons.

Caveats and model limitations

Bubble definition and size

The bubble was never formally defined for education settings. The only formal definition of bubble was for households, childcare[10] and household support.[11] Guidance to schools was to put pupils into 'distinct groups' to minimise transmission of infection, but the ideal size of the group was not specified and was at the discretion of individual school management.[12] In practice, though never formally advised, most schools implemented this at class level, that is,

[10] Making a childcare bubble with another household (archived content)
[11] Making a support bubble with another household (archived content)
[12] Schools COVID-19 operational guidance (archived content)

approximately 30 pupils. Therefore for the purposes of modelling, the assumption was that a COVID-19 postive test result would lead to self-isolation of 30 pupils.

No individual autocorrelation of test results was assumed

No individual autocorrelation of test results was assumed (distinct from autocorrelation due to viral loads): This means that if a pupil gets a false negative test result, it is assumed they are not more likely to get a negative test result next time than what is determined by their viral load. This means that in the model, repeated testing has more benefit than might otherwise be the case.

No school to community infection

Increased transmission within schools, which might lead to increased transmission in the community and as such more infected pupils coming into school has not been accounted for. This is due to the main time period being relatively short (26 days), resulting in the impact on the results to be minimal. Furthermore, the ONS Schools Infection Survey suggests that prevalence within schools, mirrors that in the community, rather than acting as a driver.

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

UKHSA is an executive agency, sponsored by the Department of Health and Social Care.

Published: January 2024
Publishing reference: GOV-15910

UKHSA supports the Sustainable Development Goals