BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-056606
Article Type:	Original research
Date Submitted by the Author:	19-Aug-2021
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Keywords:	COVID-19, PUBLIC HEALTH, QUALITATIVE RESEARCH

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An exploration of the uptake of asymptomatic COVID-19 lateral flow testing in Birmingham: survey and qualitative research

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Keywords: COVID-19; Lateral flow test; Public perceptions; Survey; Interviews

Abstract

Aim:

To examine public perspectives on lateral flow testing (LFT) for COVID-19.

Design:

Online survey with nested semi-structured interviews.

Setting:

Birmingham, UK.

Participants:

220 Birmingham residents, 21 of whom took part in an interview.

Results:

Fifty six per cent of respondents had taken a LFT. Reasons for not testing included adherence to other government COVID guidance, having had a vaccination, and not thinking LFTs were accurate. In 16% of households with children nobody, including children, was testing at home. Where children were testing, adults were often not, or were making varied decisions about which adults would test within households. Those who were testing and eligible for workplace and school testing were more likely to be testing regularly. In other settings more respondents were testing on a one off or ad hoc basis. Approximately half of respondents said that they were likely to visit friends and family after a negative test and 10% that were unlikely to self-isolate following a positive test result. Interviewees who were testing described the peace of mind that testing afforded them prior to activities or interactions with family and friends, including those they considered to be vulnerable. Interviewees who were not testing described concerns about test accuracy and also cited a lack of face-to-face interaction with others. Participants were often testing flexibly according to circumstances and perceived risk of COVID transmission.

Conclusions

Whilst some choose not to test, others are doing so in order to provide peace of mind to engage in personal interactions they might otherwise have avoided. This peace of mind may be a necessary pre-requisite for some to more fully re-engage in pre-pandemic activities. Despite clear concerns about test accuracy amongst those not testing, those who are testing held generally positive attitudes towards the continued use of LFTs.

Article Summary - Strengths and limitations of this study

- Contemporary survey and qualitative research exploring public perspectives and behaviour relating to lateral flow testing for COVID-19 in Birmingham, UK
- Online survey and in-depth interviews illustrating diversity of views and behaviour
- Relatively low response to survey and non-representative sample
- Only one student interviewee

Introduction

Lateral flow (LF) testing for asymptomatic cases of COVID-19 has become a mainstay of the UK Government's approach to the control of transmission during the current pandemic. Test kits are currently available for use at a population level, for example via online ordering, or accessed via community locations such as pharmacies (1). Testing has been implemented in specific settings where risk of transmission is thought to be higher (e.g. schools, universities, workplaces), and where individuals might be at particularly high risk of poorer outcomes should they become infected, such as prior to care home visits. Testing is increasingly being used to sanction activities, including social entertainment and travel.

However, concerns regarding the scientific basis, appropriateness and utility of population level screening using lateral flow tests (LFTs) have been raised, with questions about the likely effectiveness of testing to achieve transmission control, and the evidential basis for the UK government's approach (2). The ethical basis for school testing approaches has been questioned (3) and a Cochrane review of rapid point-of-care tests for the diagnosis of COVID-19 stated that data to support the use of LFTs in asymptomatic populations is not yet available (4).

Population level LF testing approaches were first piloted in Liverpool, UK in 2020 (5). Subsequently the accuracy of the test being used by the UK National Health Service, the INNOVA LFT, has been reported (6) (7), with performance being markedly improved at higher viral loads. However, there is continued debate regarding the basis for the reported estimates of test accuracy following an FDA notice advising against the use of the INNOVA LFT in the USA (8, 9). As well as the evidential basis for the tests utilised in population screening, perceptions of testing and related behavioural responses, such as whether people test or not, are crucial components of screening programmes. The Liverpool pilot evaluation examined reasons for uptake of testing for COVID-19 and participants' behavioural intentions post testing (5). Other research has examined the usability and acceptability of LF testing at home, with a focus on individuals' experience of the test process itself rather than motivations for testing (10).

The aim of this study was to further examine public perspectives on lateral flow testing for COVID-19 at a time of national population level screening beyond the initial pilot and increasing rates of COVID-19 vaccination. The research explored reasons for uptake or refusal of testing in different settings; patterns of testing (frequency, who within households is testing); experience of the testing process; perceptions of test accuracy and behavioural intentions post testing. An online survey with a nested sample of follow up semi-structured interviews with participants was undertaken in the City of Birmingham, UK.

Methods

Study design

The study was an online survey with nested semi-structured interviews with a sample of survey respondents.

Sample

The online survey opened on 9 April 2021 and any resident aged 18 or above in Birmingham, UK, (defined as anybody resident within the Birmingham City Council catchment area) was eligible to participate. The survey was advertised online, via social and other media, and by poster at test sites in Birmingham. Survey participants gave informed consent and were asked to indicate if they would be willing to take part in a follow up interview. A purposive sample of survey respondents were invited to interview based upon their demographic characteristics and survey responses (e.g., age, testing / not testing, setting for testing, perspectives on testing).

Survey content

The survey tool contained a mix of fixed (categorical and likert scale) and free text response items. It was organised according to setting for testing (walk-in / at home; school / household / bubble; workplace; university) and participants were asked to indicate which setting/s were relevant to them. Questions included; details of test uptake / non-uptake; reasons for test uptake / non-uptake; frequency of testing; experience of the testing process; perceptions of test accuracy; post test result behavioural intentions; demographic data for respondents and indication of willingness to participate in a follow up interview.

Interviews

Semi-structured interviews were conducted via telephone or video conferencing and were audio-recorded. Interview content was designed to provide further detailed exploration of interviewees' survey responses and the reasoning underpinning these. Discussion of participants' views regarding testing to enable activities was also included.

Analysis

Survey data were analysed using simple descriptive statistics and content analysis for free text comments. Interview data were analysed thematically from interview recordings. CP and RP undertook initial analyses, which were shared and discussed with the other authors. Initial analytical summaries were created for each interview and an analytical matrix was established by cross-tabulating individual participant responses with key analytical questions, prior to summarising the data.

Findings

There were 220 responses from Birmingham residents to the online survey, 21 of whom took part in a follow up interview (Table 1).

Key Survey Findings

Across all settings, 56% of respondents had taken a test and approximately half of respondents had tested via a walk-in facility or the home ordering service (Table 2). The majority of respondents for whom University and Workplace-based testing was relevant stated they had already taken a test or intended to do so (Table 3). Sixteen per cent of respondents in a household with children or part of a childcare support bubble stated that no one (including children) in the household or childcare support bubble was testing at home (Table 4). For households comprising a child attending a secondary school or college this figure was 10%.

For those individuals not testing the most frequently stated reasons were personal adherence to other government guidance, having had a COVID vaccination, not thinking that LFTs are accurate, perceiving the test to be painful or uncomfortable, and not having symptoms of COVID-19. Adults in households with school or nursery aged children who were not regularly testing gave reasons for this including choosing to test if they had a specific contact outside the home or were leaving the home frequently, parents taking turns to test, or that the parent with most contact with the children tested. Those who didn't test at all included people who stated they were working from home and would not come into contact with others, or that the school only supplied tests for their children.

Of those respondents who were testing, a greater proportion of those using home ordering, nursery, school, college or workplace testing were testing regularly compared to respondents using walk-in or university testing (Table 5). Of those testing regularly more respondents in the workplace (94%), nursery, school or college (80%) and using home ordering (74%) stated they were testing twice weekly than those using walk-in (45%) or university-based (27%) testing (Table 6).

On the whole survey respondents stated that test instructions were clear, testing was easy, and results were very easy to understand (Table 7). The majority of respondents (70%) stated that LFTs were somewhat accurate (Table 8). Only 5% of respondents stated that tests were accurate.

When asked regarding post-test behaviours after negative test results a high proportion of respondents indicated that they would be likely to maintain actions including hand washing, social distancing and wearing face coverings in enclosed spaces. Just over half of respondents stated they were likely or very likely to visit friends and family following a negative result and 65% that they would go shopping. Following a positive test result 10% of respondents stated that they were unlikely or highly unlikely to self-isolate and 90% that they would get a confirmatory PCR test.

Interview findings

Reasons for testing

Across all test settings, those who were testing predominantly described the peace of mind (regarding personal risk of transmission to others) that LF testing afforded. This was important when

transitioning to settings where face-to-face interactions take place, such as from studying at home to studying on campus, going back to the office, or going to the shops:

> *'Gives me peace of mind that I'm not going to spread it without symptoms… that other people in the office are testing and I can safely interact with them, and I know that if I go to the supermarket or see someone not in my household I know I'm not going to spread it to them as well.'* (ID 8)

Some interviewees were conscious that they had close contacts who were worried about being infected, or who were shielding due to being clinically vulnerable. Therefore, testing was seen as a tool to ensure those closest to them also had peace of mind in their company:

> *'I test to make sure I don't have COVID before going home, my family are anxious about COVID being brought back from campus. Having a negative helps them feel at ease.'* (ID 1)

Another interviewee who had direct experience of mandatory testing for care home visits suggested that they would take a test prior to contact with someone they perceived to be vulnerable, although this was caveated with a statement regarding low death rates at the time of interview;

> *'I have to take tests to visit friend in care home. If I felt I was seeing someone vulnerable and there was still COVID around I would take one [a test] but there was only 1 death in the country yesterday.'* (ID 6)

Those working in a setting where they had a duty of care for others, such as in adult social care or schools, were keen to emphasise how testing provided peace of mind regarding work-based interactions:

> *'Because I work with children, I just want to make sure I'm not passing anything on really.'* (ID 11)

Other workplace participants all described testing at least in part due to being asked to by their employer. However, participants on the whole appeared to feel their employers were justified in recommending lateral flow testing. Across settings the convenience of testing was also suggested to be key to uptake:

> *'It's really convenient to get tested due to being on campus, I can see the testing site from my window.'* (ID 1)

Participants largely found the testing process easy and quick since the roll out of home testing kits, and one participant contrasted this with their previous experience of traveling to a central location in Birmingham to get tested. Several interviewees anticipated using testing as government guidance is relaxed, to check they are 'COVID free' before meeting friends and family:

> *'The world's re-opening, we're seeing more people and I'm doing more tests at home…. I test before and after meet ups... if it gets us a normal life again I'm all for it* [testing], *I really am… I'd quite like to be able to make plans with friends without thinking right ok we can only meet outside and the weather's doing this so yeah I just want that bit more freedom.'* (ID 5)

A small number of interviewees had secondary school age children. Parents reported face-to-face contact with grandparents as a key motivator for children to get tested, suggesting children missed their Grandparents during periods of lockdown:

> *'making sure that everyone was negatively tested as they should be, that was quite an incentive for our daughters to do it, like ok we get to see nanny'.* (ID19)

Parents felt safer meeting more vulnerable relatives with their children, due to testing. These parents appeared to drive their children's testing behaviour. For example, one parent indicated their identity as a nurse was key in their children understanding the importance of testing:

> *'As a nurse I've tried to impress onto them the importance of detecting what we can detect.'* (ID 10)

Reasons for not testing

Whilst some interviewees who were testing were also concerned about test accuracy, this was cited as a contributing factor to a decision not to test by others who were '*not convinced these LF ones are accurate*.' (ID 15). Some interviewees were concerned about self-isolation as a result of a false positive result, something they felt was more common than a true positive:

> *'The false positive rate is between 1/1000 and 3/1000 and people with covid is 1/600. If you work that out, that is more false positives than true positives.'* (ID 9)

Whilst others were more concerned about the impact of false negatives and the '*green light'* (ID3) effect this may have on public behaviour:

> *'I have concerns about tests… There's a high chance of false positives and negatives, not accurate enough. Not being used as intended. They're being used as a green light… There's a very low chance of picking up cases via LFTs and it's not worth the phenomenal cost… As the level of COVID in the population drops the validity of mass testing drops as well.'* (ID 3)

Some interviewees felt safe from infection and therefore did not see the value in regular lateral flow testing:

> *'I'm not going out so not something that I've needed to have… if I haven't got symptoms and I'm not going anywhere, why do I need a test?'* (ID 17)

In this instance a lack of face-to-face interaction with those outside their household guided behaviour. However, other participants also suggested that low virus prevalence meant they were unlikely to contract COVID-19 and therefore did not need to test. Furthermore, some participants who had received one or two doses of a COVID-19 vaccine were reluctant to use lateral flow tests as they felt their chances of both catching and passing on COVID-19 were low:

> *'If I hadn't had both of them* [vaccinations] *I probably would have had more lateral flow tests by now.'* (ID 12)

Some felt reassured that another in their household was testing and felt this was an indicator of their own risk of transmission to others:

> *'My partner was still getting tested every week so I'm using him as my benchmark really.'* (ID 5)

Whilst not prevalent in the interview sample, one participant discussed '*selfishly'* (ID 15) not wanting to engage in testing due to the amount of isolation their children had already faced during the pandemic, and the impact this had on both their children's education, and their ability to work from home:

> *'From a selfish point of view, I didn't want to have to do them and then have to self-isolate because my daughter has missed so much school and I've missed so much work.'* (ID 1).

One participant was very anxious about the impact of self-isolation on their child due to an intellectual disability. This condition had been assessed as at risk of developing if isolated in their home:

> *'My daughter has an intellectual disability that has been determined by a professional as being at risk of exacerbation by periods of isolation… Not a risk I'm prepared to take, I have to put my daughter first.'* (ID 9)

One parent discussed how the school suggested parents test, but then did not follow up with provision of the correct amount of testing kits for whole households. They felt this acted as a disincentive to parent testing. They stated they have not heard from the school since about adult/parent testing:

> *'Schools said it would be good if parents tested too but sent kits home for the kids but not the family. It's never been mentioned again by the school.'* (ID 20)

One initial government policy for schools, that of insisting on self-isolation following a positive school-conducted LFT, even if the following PCR test was negative, was felt to have been damaging, not only due to unnecessary self-isolation but due to the number of parents who opted out of testing as a result:

> *'Telling schools that the three [LFT] tests you do on site...if anyone tests [positive] the whole family isolates for 10 days, that's why parents were refusing permission for their children to do the lateral flow tests.' (ID13)*

Some interviewees who had taken the decision not to take part in LF testing suggested that there was a strong feeling of social disapproval associated with this, with stigmatisation of individuals who took this decision:

> *'This is where I get really worried about where we are going as a society, we haven't told anyone we are not testing, because I know they'll be backlash, so I feel I have to keep it a secret, even though I'm comfortable with my choice, and I know I'm acting in the best interests of my family…People would say I'm being very selfish, I think people actually believe that the testing is a way to stop transmission, and I'm not totally convinced…I feel that LFT may have a role in reducing transmission, but that comes at a cost and I feel it's not OK to discuss that cost.'* (ID 9)

Frequency of testing

Interviewees who reported testing varied in terms of testing frequency from twice per week to one-off usage. The majority reported testing twice weekly, although it should be noted that student households are underrepresented in the interview sample. Some participants stated that they were simply following government, school or workplace guidance, without understanding why twice-weekly testing is recommended:

> *'Because that's what we were told to do* [testing twice per week]*, that makes us sound like sheep, I know!" I don't know the science behind it.'* (ID 2)

A minority of participants suggested they were not testing regularly, but would test before having interaction with people outside their household. Concordant with the peace of mind that interviewees discussed as a reason for testing, this was particularly the case if the person(s) they were having contact with were perceived to be clinically vulnerable:

'I take one once a week before visiting my father in his care home. I work from home and I'm not leaving the house. If I was going out I would take two a week it's not a problem.' (ID 3)

These interviewees tested flexibly according to circumstances and perceived risk of transmission:

'It might be once a week, it might be twice a week, it might be not at all, it's just based on how much I'm actually leaving the house.' (ID 5)

Perceptions of test accuracy and impact on behaviour

Regardless of reported testing behaviour interviewees felt that lateral flow tests could be inaccurate. Those who were testing tended to suggest that negative test results would not influence their behaviour due to possible false negative test results. This was despite the peace of mind they suggested regular testing gave them, and indications they would test before socialising with others:

'The test is a guide, if negative it will not change my behaviour. Won't make me think yeah, yeah, I'm fine. I will still take precautions. I don't assume I'm negative; all test results have a degree of failure.' (ID 2)

Perceived lack of test accuracy, was however, reported to be a key factor in decision-making for those who refused to test. Some who were not testing felt that the risk of a false positive result was too high, citing the implications of such a result on their lives, and in some cases, society more broadly:

'*A false positive is not benign, they may send 100 kids home, on a false positive.'* (ID 9)

Those who were testing however, felt LFTs were of value as *'not every test is going to be inaccurate'* (ID 2) and therefore, due to some COVID cases being picked up, it was still a worthwhile strategy:

'I know that the LFTs aren't 100% but if it identifies one person whose got it who if they didn't know about it could've spread it then it's worthwhile isn't it' (ID 4)

LFTs were also sometimes used as a screening tool to give some sense of whether you were likely to have COVID prior to a PCR test. Participants who were testing reported being keen to obtain a confirmatory PCR test following a positive LFT result, and isolate their household until a PCR result was received:

'You go and get a PCR test and everyone isolates till that result comes back, end of.' (ID 13)

Many interviewees reflected on the fact that LFTs were less accurate than PCR tests, both inherently and due to being self-administered. Some suggested that the use of LFTs for asymptomatic testing was not their intended purpose. The knowledge that experts disagree about their proper use confirmed one interviewee's belief that *'I don't think the use of them is evidence based'* (ID 3). This perceived lack of coherence was seen to be *'another example of politics over science'* (ID 3). LFTs perceived lack of accuracy was discussed as having several ramifications. False negatives were felt to lead to a false sense of security which could increase risky behaviours and thereby *'aid the spread'* (ID 3) of COVID. Even true negatives were seen to have a disadvantage in reducing caution:

'It should be a red light system not a green light system…a negative shouldn't mean you're free to carry on as normal but a red light could be useful' (ID 3).

Equally, false positives were felt to be putting people in isolation on *'shaky data'* (ID3). Some interviewees were concerned about people taking LFTs when they had COVID symptoms, then deciding not to get a PCR test or self-isolate as their LFT result was negative. With a view to the mass

scale of LF testing, issues of accuracy led some interviewees to declare *'I don't think the cost of them is justified'* (ID 3).

Experience of testing and reporting results

In agreement with our survey findings the clarity of LFT instructions was generally discussed very favourably by interviewees. Overall tests were described as unpleasant, but this was seen as short lived and did not outweigh the peace of mind offered by testing:

> *'Still makes me heave and eyes water, but the feeling passes quickly, and a small price to pay if COVID infections are prevented by the testing strategy.'* (ID 2)

Some parents described children having a very negative experience of the test, but again this did not necessarily deter them from further testing:

> *'Children hate it, it's not a nice thing for them to do. I don't like doing it, but I just get on with it… I think it's the responsible thing to do.'* (ID 21)

Most interviewees stated that they would report all test results, however some would only report a positive test result and one discussed the possibility of not reporting a positive result due to concerns over test accuracy. Many described the NHS Test and Trace reporting system as adequate, however some of those reporting results for someone else (often a child) found it frustrating having to upload the same details multiple times. Communication of positive test results through the contact tracing feature of the Test and Trace system was not always successful, with known contacts being informed personally by the individual but not through the Test and Trace system.

Post-test behaviour and self-isolation

When asked, most interviewees stated that a negative test result would not alter their social and personal behaviours relating to COVID risk. This was because a negative result was not seen as a guarantee of being COVID free and also due to a desire to keep following government guidance. However, this must be contrasted with interviewees' use of the test to afford peace of mind for personal interactions. Accordingly, some interviewees reflected how negative test results were subconsciously impacting on their comfort with certain behaviours:

> *'In my head initially I want to say not…some behaviours have diminished…washing hands for as long? 'Maybe I'm more relaxed in some measures because I'm pretty sure none of us have got Coronavirus…not intentionally but that might be happening.'* (ID 19)

When talking hypothetically about a positive LFT result participants overwhelmingly stated a need to get a confirmatory *'real* [PCR] test' (ID 1) and self-isolate as *'you don't want to be responsible for other people's deaths'* (ID 21). However, one interviewee felt the act of going to a test centre for a PCR test may carry an unacceptable risk of transmitting COVID.

The practical effects of self-isolation on work-life ranged from very little for those already working from home, to time off work with a guaranteed income, to loss of income for the self-employed. Psychological responses were equally varied, with one interviewee reporting that *'It would be hard to not leave the house for 10 days but it wouldn't be hugely different from what I do now'* (ID 12), whereas another described how *'I would probably go into a panic* [about the safety and running of the workplace].' (ID 14) One common struggle was the work-life balance of families isolating with children:

'I would have to try and work with them here, and it's not fun and it's really hard. The school now would expect us to do home schooling, on top of working' (ID 14).

A lack of outdoor exercise was reported as likely to have a deleterious effect on mood for some interviewees, however many people with their own garden felt this provided some sense of freedom. Some interviewees believed that even when self-isolating, a solitary walk would be acceptable for mental health reasons as would shopping if no one else could assist them. Disappointment was also described by some at not being able to visit family and friends. Overall, a common feeling was an awareness of the potential difficulties but a belief that they could be tolerated as a temporary, *'pretty minor inconvenience'* (ID 20). However, delays due to family members succumbing to COVID in succession, was felt to be the *'nightmare scenario.'* (ID 19)

Views regarding societal use of LFTs

Societal impact

In broader terms LFTs were seen to be useful in *'Enabling a bit more normality'* (ID 13), supporting confidence in forming bubbles, travel, social events, work, school attendance and wider societal opening. Several interviewees placed LFTs within the context of other elements in the country's response to COVID:

'A useful tool along with other things - the masks, the vaccine, the social distancing. I don't think they're the be all and end all, I think they're just like part of that suite of precautions.' (ID 4)

'vaccination is the great clincher but in the meantime LFTs will help people get their confidence back.' (ID 6)

It was felt that lateral flow testing could be useful in identifying asymptomatic cases, thereby helping to reduce spread:

'In reducing the spread extremely useful…because of the fact you can have no symptoms of it, you could be wondering around feeling absolutely fine but the test comes back as positive so you know you've got to reduce contact with everyone else' (ID 5).

One respondent particularly felt that LFTs 'Would have a role to play if a new variant increased prevalence.' (ID 9)

Testing to attend social events

The majority of participants responded favourably to the idea of 'test to do' as a policy approach, and most suggested they would be happy to test, if for example they were attending an event or travelling abroad:

'It [test to do] doesn't bother me in the least…Yeah, yeah, it's protecting everybody.' (ID 7)

However, some practical concerns were raised. Some felt it was a very challenging policy to implement effectively. For example, one interviewee suggested attendees could test themselves inappropriately or manipulate samples to ensure a negative test result:

'Might be temptation to not do test properly, possible people would not adhere to social distancing guidelines, particularly youngsters' (ID 10)

Having to provide a negative LFT result in order to attend large social events was felt to be particularly hazardous, as false negative results could lead to a possible outbreak.

The elderly

Particular issues were raised with regard to older relatives, with one interviewee describing their concerns that they may be less tech savvy so may not be able to order tests online, but also high risk for COVID so may not want to collect from a centre due to possible exposure. A concern was also expressed that some elderly people with mobility issues may find conducting LFTs difficult as they require a degree of dexterity.

Communication

> *'You think there's been loads of communication* [about LFTs] *but it's actually quite easy as a citizen to miss it'* (ID 12*).*

Not all participants felt the communication around LF testing had been gauged correctly for them. Some who were less active on social media would have preferred physical adverts in shops where testing kits were available. One interviewee particularly disliked what he saw as the negative tone of government advice, instead of adverts that they saw as shaming people for not following guidance, they would have preferred a more positive, straightforward narrative informing people how to take a test and where to get one.

Some interviewees reported an *'impression not many people are doing them* [LFTs]' (ID1 9) perhaps due to the altruistic nature of testing.

> *'nobody's doing it to protect themselves, the protection is if you know someone else has a negative test, so there's no incentive for anyone to do it.'* (ID 6)

Discussion

Other than the Liverpool COVID-19 Community Testing Pilot (5) we believe that this is the first study to explore public perspectives regarding population level lateral flow testing strategies currently being employed in the UK. Whilst many of the findings presented here resonate with the Liverpool findings, that evaluation was undertaken under very different circumstances as a pilot focused on a city with high rates of infection, under Tier 3 UK government COVID restrictions at commencement, and accompanied by mass media interest. The survey responses and interviews in this study provide further insight into reasons for test uptake, perceptions of LFT accuracy and post-test behavioural intentions as LFT strategies have been established at a national level at a later period in the pandemic, and during a mass vaccination programme.

The survey and interviews demonstrate population awareness that LFTs do not have equivalent test accuracy properties to PCR testing. As also demonstrated in the Liverpool pilot evaluation, for some participants this was sufficient to influence decisions to not test, with concerns expressed in interviews regarding the individual and societal implications of false positive and false negative test results. However, others were not accessing LF testing as they perceived themselves to be at low risk of transmitting the virus to others, were following other government guidance at the time of the data collection (handwashing, social distancing, wearing of face coverings), or believed that having received one or two doses of a COVID-19 vaccination that they were at lower risk of infection.

Those who were testing suggested in survey responses that negative test results would not influence behaviours such as social distancing and wearing of face coverings. However, testing was seen as a way to afford individuals peace of mind when interacting with others, including family and friends and those perceived to be more vulnerable to the effects of COVID-19 infection. In the Liverpool pilot evaluation 16% of respondents stated that they would also highlight the peace of mind given by testing if promoting testing to others. In fixed survey responses in the Birmingham survey more than half of participants stated that there were likely to see friends and family following a negative LFT result. Some interviewees who were testing or had tested were clear that despite knowledge that LFT accuracy was not perfect, they were using testing to 'green light' personal interactions. These findings differ from those of the pilot scheme evaluation where only 4% of respondents to an Office for National Statistics (ONS) survey stated that they intended to carry out social activities following a negative test (5). Our findings indicate that behavioural intentions may have shifted as restrictions have gradually been eased, as testing has been utilised to enable a range of activities, and as the vaccination programme has progressed.

Furthermore, whilst survey respondents in school and workplace settings were more likely to report testing twice weekly according to government guidance, others reported testing on an occasional or ad hoc basis, associated with interactions outside of the immediate household. In secondary school households approximately 10% of respondents stated that nobody, including school children were testing; 16% when including all school households. Again, reports of perceived poor test accuracy were implicated in these decisions, along with the influence of policy decisions such as the lack of confirmatory PCR testing for within-school positive LFT results for a period of time. Where children were testing, adults were often not, or were doing so on an ad hoc basis that was rationalised in different manners within households. There were several reports of negative experiences when trying to undertake home testing of children, particularly regarding the comfort of testing. There has been speculation that implausibly low positive test rates in children at school may be caused by poor swab technique (11). It is probable that this may be moderated by improving test comfort. Therefore, further research should explore ways to improve comfort when using LFTs, including the potential for parental involvement and swab design to improve acceptability *and* sensitivity of LFTs.

Whilst there was some scepticism about population-level LF testing strategies amongst some participants who cited a political rather than scientific basis for testing, others suggested that

screening for cases of COVID-19 can only be a good thing. These interviewees were in favour of test-to-do strategies, such as to attend events. A small number of participants did suggest that they were not engaging in testing due to the perceived risk and negative consequences of self-isolation on educational, work or family life. We would estimate that this is likely to be more prevalent at population level as this was a key theme emerging from the Liverpool evaluation. Participants also suggested that access and practicability of LF testing may be difficult for certain individuals, including those with physical impairments or conditions such as arthritis.

Limitations

Response to the survey was low, although the survey ran during a period of relatively low and falling rates of infection, hospitalisation and deaths (12), and during the early stages of a vaccination programme. Furthermore, we know from these data that the vaccination programme was one reason for not taking a LFT, potentially limiting recruitment to the survey. Whilst the sample is not representative of the Birmingham population, the findings do illustrate the likely diversity of views and behaviour in relation to LF testing. There were a number of university-based respondents to the survey which may have skewed some views regarding testing, for example where respondents were more familiar with the emerging evidence related to test accuracy. We also struggled to recruit students to the interview portion of this research and were reliant on relatively rapid conduct and analysis of interviews within a short timescale. However, we were able to focus on core analytical questions and use a team-based approach to analysis and interpretation.

Conclusions

These data demonstrate that whilst some people are choosing not to undertake lateral flow testing for asymptomatic COVID-19, others are doing so in order to provide the peace of mind needed to engage in personal interactions that they may otherwise avoid. This seems to be directly in tension with the initial justifications for population level screening using lateral flow tests. That is, their use as evaluated in the Liverpool pilot, to identify cases of COVID-19 and reduce transmission, without changing personal behaviours that might increase transmission risk. Indeed there seems to have been a significant policy drift in the use of LFTs in order to sanction activities – travel, visits to vulnerable relatives, and more recently daily testing to deal with rates of isolation associated with the NHS test and trace app. When juxtaposed with the serious contentions to the use of LFTs as an effective public health measure (poor test accuracy for purpose, design for use in symptomatic populations, ethics and consent for testing) questions remain concerning the intentions behind the continued use of INNOVA lateral flow tests as restrictions are eased. The peace of mind described by participants in this research may well be a pre-requisite for people to more fully engage in activities they would otherwise be wary of. This is despite the current lack of evidence to support the continued use of asymptomatic lateral flow testing as a public health measure. However, it is clear that many are engaging in lateral flow testing and despite expressed concerns regarding test accuracy, those who are doing so hold generally positive attitudes towards their continued use.

Acknowledgements

The authors would like to thank the study participants and also collaborators in Birmingham City Council and NHS Test and Trace who gave feedback on the survey design and facilitated survey distribution.

Funding statement

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests

The authors do not have any competing interests to declare.

Contributions

JM: Conception and design of research, creation of interview schedule, analysis, drafting of manuscript and findings, substantial revisions to manuscript. CP: Conduct of interviews, qualitative analysis, quantitative analysis, drafting of findings, revisions to manuscript. DT: Creation of online survey, quantitative analysis, qualitative analysis, drafting of findings, revisions to manuscript. GR: Data analysis, critical appraisal of draft findings and manuscript. RP: Conduct of interviews, qualitative analysis, quantitative analysis, drafting of findings, revisions to manuscript.

Ethics

This study was granted ethical approval by the University of Birmingham Research Ethics Committee.

Word Count: 6022

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Table 1 Interview sample characteristics

[Note: Removed by editor at acceptance. Please see final version of manuscript.]

Table 2. Test uptake

Test source	**Total (n=220)**
Walk-in facility in Birmingham	59 (27)
Home ordering service in England	75 (34)
Neither	106 (48)

Table 3. Test uptake/ intention to test

	University (n=52)	**Workplace (n=96)**
Already taken test	34 (65)	67 (70)
Intend to take test	9 (17)	12 (13)
No intention to test	9 (17)	17 (18)

Table 4. Test uptake/ intention to test (in households with children in education)

	Total (n=77)
Respondent	9 (12)
Respondent/ Another adult	17 (22)
Respondent / Another adult/ Children	15 (20)
Respondent / Children	5 (7)
Another adult	4 (5)
Another adult/ Children	2 (3)
Children	13 (17)
None	12 (16)

Table 5. Test regularity

	Walk-in (n=59)	**Home ordering (n=75)**	**Nursery, School, College (n=49)**	**University (n=43)**	**Workplace (n=79)**
Regularly	20 (34)	53 (71)	39 (80)	12 (28)	66 (84)
Occasionally	23 (29)	12 (16)	9 (18)	25 (58)	12 (15)
Once	16 (27)	10 (13)	1 (2)	6 (14)	1 (1)

Table 6. Test frequency

	Walk-in (n=20)	**Home ordering (n=53)**	**Nursery, School, College (n=39)**	**University (n=11)**	**Workplace (n=66)**
≥3 weekly	0 (0)	2 (4)	0 (0)	0 (0)	1 (2)
2 weekly	9 (45)	39 (74)	31 (80)	3 (27)	62 (94)
1 weekly	8 (40)	11 (21)	7 (18)	7 (64)	3 (5)
<1 weekly	3 (15)	1 (2)	1 (3)	1 (9)	0 (0)

Table 7. Experience of testing and reporting results		
Clarity of instructions (n=75)	Very clear	65 (87)
	Slightly clear	6 (8)
	Neither	1 (1)
	Slightly unclear	3 (4)
	Very unclear	0 (0)
Difficulty of taking test (n=75)	Very easy	45 (60)
	Slightly easy	13 (17)
	Neither	5 (7)
	Slightly difficult	9 (12)
	Very difficult	3 (4)
Difficulty of understanding test results (n=75)	Very easy	72 (96)
	Slightly easy	1 (1)
	Neither	1 (1)
	Slightly difficult	1 (1)
	Very difficult	0 (0)
Difficulty of reporting results (n=57)	Very easy	30 (53)
	Slightly easy	16 (28)
	Neither	3 (5)
	Slightly difficult	6 (11)
	Very difficult	2 (4)

Table 8. Perception of test accuracy	
Accuracy	**Total (n=220)**
Accurate	11 (5)
Somewhat accurate	153 (70)
Somewhat inaccurate	36 (16)
Inaccurate	15 (7)
Do not know	5 (2)

BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-056606.R1
Article Type:	Original research
Date Submitted by the Author:	10-Feb-2022
Complete List of Authors:	Mathers, Jonathan; University of Birmingham, Institute of Applied Health Research Poyner, Christopher; The University of Birmingham, Institute of Applied Health Research Thompson, Dean; The University of Birmingham, Institute of Applied Health Research Rudge, Gavin; The University of Birmingham, Institute of Applied Health Research Pritchett, Ruth; The University of Birmingham, Institute of Applied Health Research
Primary Subject Heading:	Public health
Secondary Subject Heading:	Infectious diseases, Qualitative research
Keywords:	COVID-19, PUBLIC HEALTH, QUALITATIVE RESEARCH

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An exploration of the uptake of asymptomatic COVID-19 lateral flow testing in Birmingham, UK: Survey and qualitative research

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Keywords: COVID-19; Lateral flow test; Public perceptions; Survey; Interviews

ABSTRACT

Aim:

To examine public perspectives on lateral flow testing (LFT) for COVID-19.

Design:

Online survey with nested semi-structured interviews.

Setting:

Birmingham, UK.

Participants:

220 Birmingham residents, 21 of whom took part in an interview.

Results:

Fifty six per cent of respondents had taken a LFT. Reasons for not testing included adherence to other government COVID-19 guidance, having had a vaccination, and not thinking LFTs were accurate. In 16% of households with children nobody, including children, was testing. In households where children were testing their parents or other adults were often not. Those who were testing and eligible for workplace and school testing were more likely to be testing twice weekly. In other settings respondents were more likely to be testing on a one off or ad hoc basis. Approximately half of respondents said that they were likely to visit friends and family after a negative test result and 10% that they were unlikely to self-isolate following a positive test result. In interviews participants who were testing described the peace of mind that testing afforded them prior to activities or interactions with family and friends, including those they considered to be vulnerable. Interviewees who were not testing described concerns about test accuracy and also cited a lack of face-to-face interaction with others precluding the need to test. Participants were often testing flexibly according to circumstances and perceived risk of COVID-19 transmission.

Conclusions

Whilst some choose not to test, others are doing so in order to provide peace of mind to engage in personal interactions they might otherwise have avoided. This peace of mind may be a necessary pre-requisite for some to more fully re-engage in pre-pandemic activities. Despite clear concerns about test accuracy amongst those not testing, those who are testing held generally positive attitudes towards the continued use of LFTs.

Article Summary - Strengths and limitations of this study

- Contemporary survey and qualitative research exploring public perspectives and behaviour relating to lateral flow testing for COVID-19 in Birmingham, UK
- Online survey and in-depth interviews illustrating diversity of views and behaviour
- Relatively low response to survey and non-representative sample

INTRODUCTION

Lateral flow (LF) testing for asymptomatic cases of COVID-19 has become a mainstay of the UK Government's approach to the control of transmission during the current pandemic. Test kits are currently available for use at a population level, for example via online ordering, or accessed via community locations such as pharmacies (1). Testing has been implemented in specific settings where risk of transmission is thought to be higher (e.g. schools, universities, workplaces), and where individuals might be at particularly high risk of poorer outcomes should they become infected, such as prior to care home visits. Testing is increasingly being used to sanction activities, including social entertainment and travel.

Concerns regarding the scientific basis, appropriateness and utility of population level screening using lateral flow tests (LFTs) have been raised, with questions about the likely effectiveness of testing to achieve transmission control, and the evidential basis for the UK government's approach (2). The ethical basis for school testing approaches has been questioned (3) and a Cochrane review of rapid point-of-care tests for the diagnosis of COVID-19 stated that data to support the use of LFTs in asymptomatic populations is not yet available (4).

Population level LF testing approaches were first piloted in Liverpool, UK in 2020 (5). Subsequently the accuracy of the test being used by the UK National Health Service, the INNOVA LFT, has been reported (6) (7), with performance being markedly improved at higher viral loads. However, there is continued debate regarding the basis for the reported estimates of test accuracy following an FDA notice advising against the use of the INNOVA LFT in the USA (8, 9). As well as the evidential basis for the tests utilised in population screening, perceptions of testing and related behavioural responses, such as whether people test or not, are crucial components of screening programmes. The Liverpool pilot evaluation examined reasons for uptake of testing for COVID-19 and participants' behavioural intentions post testing (5). Other research has examined the usability and acceptability of LF testing at home, with a focus on individuals' experience of the test process itself rather than motivations for testing (10).

The aim of this study was to further examine public perspectives on lateral flow testing for COVID-19 at a time of national population level screening and increasing rates of COVID-19 vaccination. The research explored reasons for uptake or refusal of testing in different settings; patterns of testing (frequency, who within households is testing); experience of the testing process; perceptions of test accuracy and behavioural intentions post testing. An online survey with a nested sample of follow up semi-structured interviews with participants was undertaken in the City of Birmingham, UK.

METHODS

Study design

The study was an online survey with nested semi-structured interviews with a sample of survey respondents.

Sample

The online survey opened on 9 April 2021 and any resident aged 18 or above in Birmingham, UK, (defined as anybody resident within the Birmingham City Council catchment area) was eligible to participate. Participants were asked to provide the first part of their postcode to confirm eligibility. The survey was advertised online, via social and other media, and by poster at test sites in Birmingham. Survey participants gave informed consent and were asked to indicate if they would be

willing to take part in a follow up interview. A purposive sample of survey respondents were invited to interview based upon their demographic characteristics and survey responses (e.g., age, testing / not testing, setting for testing, perspectives on testing).

Survey content

The survey tool contained a mix of fixed (categorical and likert scale) and free text response items (online supplemental appendix 1). It was organised according to setting for testing (walk-in / at home; school / household / bubble; workplace; university) and participants were asked to indicate which setting/s were relevant to them. Questions included; details of test uptake / non-uptake; reasons for test uptake / non-uptake; frequency of testing; experience of the testing process; perceptions of test accuracy; post test result behavioural intentions; demographic data for respondents and indication of willingness to participate in a follow up interview.

Interviews

Semi-structured interviews were conducted via telephone or video conferencing and were audio-recorded. Interview content was designed to provide further detailed exploration of interviewees' survey responses and the reasoning underpinning these (online supplemental appendix 2). Discussion of participants' views regarding testing to enable activities was also included.

Analysis

Survey data were analysed using simple descriptive statistics and content analysis for free text comments. Interview data were analysed thematically from interview recordings. CP and RP undertook initial analyses, which were shared and discussed with the other authors. Initial analytical summaries were created for each interview and an analytical matrix was established by cross-tabulating individual participant responses with key analytical questions, prior to summarising the data.

Patient and Public Involvement

The draft online survey tool was piloted amongst a small convenience sample of members of the public and other stakeholders including staff based at Birmingham City Council and local NHS Test and Trace. Question formulation and response categories were amended based upon feedback. The research project was conceptualised following discussion with collaborators in Birmingham City Council and NHS Test and Trace.

RESULTS

There were 220 responses from Birmingham residents to the online survey, 21 of whom took part in a follow up interview (Table 1). Of those that provided demographic date the mean age of survey respondents was 45; 75% were female and 91% identified as White British. Of the interviewees 18 were female, 13 were testing regularly, two had tested once only, and six were not testing.

Key Survey Findings

Across all settings, 56% of respondents had taken a test and approximately half of respondents had tested via a walk-in facility or the home ordering service (Table 2). The majority of respondents for whom University and Workplace-based testing was relevant stated they had already taken a test or intended to do so (Table 3). Sixteen per cent of respondents in a household with children or part of

a childcare support bubble stated that no one (including children) in the household or childcare support bubble was testing at home (Table 4). For households comprising a child attending a secondary school or college this figure was 10%.

For those individuals not testing via walk-in centres (n=188), the most frequently stated reasons were accessing lateral flow testing elsewhere such as via schools and the workplace (n=57) personal adherence to other government guidance (n=46), having had a COVID-19 vaccination (n=21), not thinking that LFTs are accurate (n=28), perceiving the test to be painful or uncomfortable (n=16), and not having symptoms of COVID-19 (n=15).

Of those respondents who were testing, a greater proportion of those using home ordering, nursery, school, college or workplace testing were testing regularly compared to respondents using walk-in or university testing (Table 5). Of those testing regularly more respondents in the workplace (94%), nursery, school or college (80%) and using home ordering (74%) stated they were testing twice weekly than those using walk-in (45%) or university-based (27%) testing (Table 6).

On the whole survey respondents stated that test instructions were clear, testing was easy, and results were very easy to understand (Table 7). The majority of respondents (70%) stated that LFTs were somewhat accurate (Table 8). Only 5% of respondents stated that tests were accurate.

When asked regarding post-test behaviours after negative test results a high proportion of respondents indicated that they would be likely to maintain actions including hand washing, social distancing and wearing face coverings in enclosed spaces. Just over half of respondents stated they were likely or very likely to visit friends and family following a negative result and 65% that they would go shopping. Following a positive test result 10% of respondents stated that they were unlikely or highly unlikely to self-isolate and 90% that they would get a confirmatory PCR test.

Interview findings

Reasons for testing

Across all test settings, those who were testing predominantly described the peace of mind (regarding personal risk of transmission to others) that LF testing afforded. This was important when transitioning to settings where face-to-face interactions take place, such as from studying at home to studying on campus, going back to the office, or going to the shops:

> *'Gives me peace of mind that I'm not going to spread it without symptoms… that other people in the office are testing and I can safely interact with them, and I know that if I go to the supermarket or see someone not in my household I know I'm not going to spread it to them as well.'* (ID 8, testing)

Some interviewees were conscious that they had close contacts who were worried about being infected, or who were shielding due to being clinically vulnerable. Therefore, testing was seen as a tool to ensure those closest to them also had peace of mind in their company:

> *'I test to make sure I don't have COVID before going home, my family are anxious about COVID being brought back from campus. Having a negative helps them feel at ease.'* (ID 1, testing)

Those working in a setting where they had a duty of care for others, such as in adult social care or schools, were keen to emphasise how testing provided peace of mind regarding work-based interactions:

> *'Because I work with children, I just want to make sure I'm not passing anything on really.'* (ID 11, testing)

Other workplace participants all described testing at least in part due to being asked to by their employer. However, participants on the whole appeared to feel their employers were justified in recommending lateral flow testing. Across settings the convenience of testing was also suggested to be key to uptake:

> *'It's really convenient to get tested due to being on campus, I can see the testing site from my window.'* (ID 1, testing)

Participants largely found the testing process easy and quick since the roll out of home testing kits, and one participant contrasted this with their previous experience of traveling to a central location in Birmingham to get tested. Several interviewees anticipated using testing as government guidance is relaxed, to check they are 'COVID-19 free' before meeting friends and family:

> *'The world's re-opening, we're seeing more people and I'm doing more tests at home…. I test before and after meet ups... if it gets us a normal life again I'm all for it* [testing], *I really am… I'd quite like to be able to make plans with friends without thinking right ok we can only meet outside and the weather's doing this so yeah I just want that bit more freedom.'* (ID 5, testing)

A small number of interviewees had secondary school age children. Parents reported face-to-face contact with grandparents as a key motivator for children to get tested, suggesting children missed their Grandparents during periods of lockdown:

> *'making sure that everyone was negatively tested as they should be, that was quite an incentive for our daughters to do it, like ok we get to see nanny'.* (ID19, testing)

Parents felt safer meeting more vulnerable relatives with their children, due to testing. These parents appeared to drive their children's testing behaviour. For example, one parent indicated their identity as a nurse was key in their children understanding the importance of testing:

> *'As a nurse I've tried to impress onto them the importance of detecting what we can detect.'* (ID 10, testing)

Reasons for not testing

Whilst some interviewees who were testing were also concerned about test accuracy, this was cited as a contributing factor to a decision not to test by others who were '*not convinced these LF ones are accurate*.' (ID 15, not testing). Some interviewees were concerned about self-isolation as a result of a false positive result, something they felt was more common than a true positive:

> *'The false positive rate is between 1/1000 and 3/1000 and people with COVID is 1/600. If you work that out, that is more false positives than true positives.'* (ID 9, not testing)

Whilst others were more concerned about the impact of false negatives and the '*green light*' effect this may have on public behaviour:

> *'I have concerns about tests… There's a high chance of false positives and negatives, not accurate enough. Not being used as intended. They're being used as a green light… There's a very low chance of picking up cases via LFTs and it's not worth the phenomenal cost… As the level of COVID in the population drops the validity of mass testing drops as well.'* (ID 3, not testing)

Some interviewees felt safe from infection and therefore did not see the value in regular lateral flow testing:

> *'I'm not going out so not something that I've needed to have… if I haven't got symptoms and I'm not going anywhere, why do I need a test?'* (ID 17, not testing)

Other participants also suggested that low virus prevalence meant they were unlikely to contract COVID-19 and therefore did not need to test. Furthermore, some participants who had received one or two doses of a COVID-19 vaccine were reluctant to use lateral flow tests as they felt their chances of both catching and passing on COVID-19 were low:

> *'If I hadn't had both of them* [vaccinations] *I probably would have had more lateral flow tests by now.'* (ID 12)

Whilst not prevalent in the interview sample, one participant discussed '*selfishly*' not wanting to engage in testing due to the amount of isolation their children had already faced during the pandemic, and the impact this had on both their children's education, and their ability to work from home:

> *'From a selfish point of view, I didn't want to have to do them and then have to self-isolate because my daughter has missed so much school and I've missed so much work.'* (ID 15, not testing).

One participant was very anxious about the impact of self-isolation on their child due to an intellectual disability. This condition had been assessed as at risk of developing if isolated in their home:

> *'My daughter has an intellectual disability that has been determined by a professional as being at risk of exacerbation by periods of isolation… Not a risk I'm prepared to take, I have to put my daughter first.'* (ID 9, not testing)

One parent discussed how the school suggested parents test, but then did not follow up with provision of the correct amount of testing kits for whole households. They felt this acted as a disincentive to parent testing. They stated they have not heard from the school since about adult/parent testing:

> *'Schools said it would be good if parents tested too but sent kits home for the kids but not the family. It's never been mentioned again by the school.'* (ID 20, tested once)

Some interviewees who had taken the decision not to take part in LF testing suggested that there was a strong feeling of social disapproval associated with this, with stigmatisation of individuals who took this decision:

> *'This is where I get really worried about where we are going as a society, we haven't told anyone we are not testing, because I know they'll be backlash, so I feel I have to keep it a secret, even though I'm comfortable with my choice, and I know I'm acting in the best interests of my family…People would say I'm being very selfish, I think people actually believe that the testing is a way to stop transmission, and I'm not totally convinced…I feel that LFT may have a role in reducing transmission, but that comes at a cost and I feel it's not OK to discuss that cost.'* (ID 9, not testing)

Frequency of testing

Interviewees who reported testing varied in terms of testing frequency from twice per week to one-off usage. The majority reported testing twice weekly. Some participants stated that they were simply following government, school or workplace guidance, without understanding why twice-weekly testing is recommended:

> *'Because that's what we were told to do* [testing twice per week]*, that makes us sound like sheep, I know!" I don't know the science behind it.'* (ID 2, testing)

Interviewees who were not testing regularly reported testing flexibly, according to circumstances, and perceived risk of transmission:

> *'It might be once a week, it might be twice a week, it might be not at all, it's just based on how much I'm actually leaving the house.'* (ID 5, testing)

Perceptions of test accuracy and impact on behaviour

Regardless of reported testing behaviour interviewees felt that lateral flow tests could be inaccurate. Those who were testing tended to suggest that negative test results would not influence their behaviour due to possible false negative test results:

> *'The test is a guide, if negative it will not change my behaviour. Won't make me think yeah, yeah, I'm fine. I will still take precautions. I don't assume I'm negative; all test results have a degree of failure.'* (ID 2, testing)

Some who were not testing felt that the risk of a false positive result was too high, citing the implications of such a result on their lives, and in some cases, society more broadly:

> '*A false positive is not benign, they may send 100 kids home, on a false positive.'* (ID 9, not testing)

Those who were testing however, felt LFTs were of value as *'not every test is going to be inaccurate'* (ID 2) and therefore, due to some COVID-19 cases being picked up, it was still a worthwhile strategy:

> *'I know that the LFTs aren't 100% but if it identifies one person whose got it who if they didn't know about it could've spread it then it's worthwhile isn't it'* (ID 4, testing)

Many interviewees reflected on the fact that LFTs were less accurate than PCR tests, both inherently and due to being self-administered. LFTs perceived lack of accuracy was discussed as having several ramifications. False negatives were felt to lead to a false sense of security which could increase risky

behaviours and thereby *'aid the spread'* (ID 3) of COVID-19. Even true negatives were seen to have a disadvantage in reducing caution:

> *'It should be a red light system not a green light system…a negative shouldn't mean you're free to carry on as normal but a red light could be useful'* (ID 3, not testing).

Equally, false positives were felt to be putting people in isolation on *'shaky data'* (ID3, not testing). Some interviewees were concerned about people taking LFTs when they had COVID-19 symptoms, then deciding not to get a PCR test or self-isolate as their LFT result was negative.

Experience of testing and reporting results

In concordance with the survey findings the clarity of LFT instructions was generally discussed very favourably by interviewees. Overall tests were described as unpleasant, but this was seen as short lived and did not outweigh the peace of mind offered by testing:

> *'Still makes me heave and eyes water, but the feeling passes quickly, and a small price to pay if COVID infections are prevented by the testing strategy.'* (ID 2, testing)

Some parents described children having a very negative experience of the test, but again this did not necessarily deter them from further testing:

> *'Children hate it, it's not a nice thing for them to do. I don't like doing it, but I just get on with it… I think it's the responsible thing to do.'* (ID 21, testing)

Most interviewees stated that they would report all test results, however some would only report a positive test result and one discussed the possibility of not reporting a positive result due to concerns over test accuracy. Many described the NHS Test and Trace reporting system as adequate, however some of those reporting results for someone else (often a child) found it frustrating having to upload the same details multiple times. Communication of positive test results through the contact tracing feature of the Test and Trace system was not always successful, with known contacts being informed personally by the individual but not through the Test and Trace system.

Post-test behaviour and self-isolation

When asked, most interviewees stated that a negative test result would not alter their social and personal behaviours relating to COVID-19 risk. However, some interviewees reflected how negative test results were subconsciously impacting on their comfort with certain behaviours:

> *'In my head initially I want to say not…some behaviours have diminished…washing hands for as long? 'Maybe I'm more relaxed in some measures because I'm pretty sure none of us have got Coronavirus…not intentionally but that might be happening.'* (ID 19, testing)

When talking hypothetically about a positive LFT result participants overwhelmingly stated a need to get a confirmatory *'real* [PCR] test' (ID 1) and self-isolate as *'you don't want to be responsible for other people's deaths'* (ID 21). However, one interviewee felt the act of going to a test centre for a PCR test may carry an unacceptable risk of transmitting COVID-19.

The practical effects of self-isolation on work-life ranged from very little for those already working from home, to time off work with a guaranteed income, to loss of income for the self-employed. Psychological responses were equally varied, with one interviewee reporting that *'It would be hard to not leave the house for 10 days but it wouldn't be hugely different from what I do now'* (ID 12), whereas another described how *'I would probably go into a panic* [about the safety and running of the workplace].' (ID 14) One common struggle was the work-life balance of families isolating with children:

> *'I would have to try and work with them here, and it's not fun and it's really hard. The school now would expect us to do home schooling, on top of working'* (ID 14, testing).

Overall, a common feeling was an awareness of the potential difficulties but a belief that they could be tolerated as a temporary, *'pretty minor inconvenience'* (ID 20, tested once). However, delays due to family members succumbing to COVID-19 in succession, was felt to be the *'nightmare scenario.'* (ID 19, testing)

Views regarding societal use of LFTs

Societal impact

In broader terms LFTs were seen to be useful in *'Enabling a bit more normality'* (ID 13, testing), supporting confidence in forming bubbles, travel, social events, work, school attendance and wider societal opening. Several interviewees placed LFTs within the context of other elements in the country's response to COVID-19:

> *'A useful tool along with other things - the masks, the vaccine, the social distancing. I don't think they're the be all and end all, I think they're just like part of that suite of precautions.'* (ID 4, testing)

> *'vaccination is the great clincher but in the meantime LFTs will help people get their confidence back.'* (ID 6, testing)

One respondent particularly felt that LFTs 'Would have a role to play if a new variant increased prevalence.' (ID 9, not testing)

Testing to attend events

The majority of participants responded favourably to the idea of 'test to do' as a policy approach, and most suggested they would be happy to test, if for example they were attending an event or travelling abroad:

> *'It [test to do] doesn't bother me in the least…Yeah, yeah, it's protecting everybody.'* (ID 7, testing)

However, some practical concerns were raised. Some felt it was a very challenging policy to implement effectively. For example, one interviewee suggested attendees could test themselves inappropriately or manipulate samples to ensure a negative test result:

> *'Might be temptation to not do test properly, possible people would not adhere to social distancing guidelines, particularly youngsters'* (ID 10, testing)

Having to provide a negative LFT result in order to attend large social events was felt to be particularly hazardous, as false negative results could lead to a possible outbreak.

Communication

> *'You think there's been loads of communication* [about LFTs] *but it's actually quite easy as a citizen to miss it'* (ID 12, tested once*).*

Not all participants felt the communication around LF testing had been gauged correctly for them. Some who were less active on social media would have preferred physical adverts in shops where testing kits were available. One interviewee particularly disliked what he saw as the negative tone of government advice, instead of adverts that they saw as shaming people for not following guidance, they would have preferred a more positive, straightforward narrative informing people how to take a test and where to get one.

Some interviewees reported an *'impression not many people are doing them* [LFTs]' (ID1 9, not testing) perhaps due to the altruistic nature of testing.

> *'Nobody's doing it to protect themselves, the protection is if you know someone else has a negative test, so there's no incentive for anyone to do it.'* (ID 6, testing)

DISCUSSION

Prior to this research, an exploration of UK public perspectives regarding population level lateral flow testing strategies was the undertaken as part of Liverpool COVID-19 Community Testing Pilot (5). Whilst many of the findings presented here resonate with the Liverpool findings, that evaluation was undertaken under very different circumstances as a pilot focused on a city with high rates of infection, during a national lockdown, and accompanied by mass media interest. The survey responses and interviews in this study provide further insight into reasons for test uptake, perceptions of LFT accuracy and post-test behavioural intentions as LFT strategies have been established at a national level at a later period in the pandemic, and during a mass vaccination programme. This research was undertaken whilst UK government advice was to access twice weekly LFT testing for asymptomatic COVID-19, and specific testing guidance for schools and households with school age children had been implemented.

The survey and interviews demonstrate population awareness that LFTs do not have equivalent test accuracy properties to PCR testing. Other studies examining perspectives on LFT test accuracy also demonstrate that individuals give varied estimates of the accuracy of these tests (11), or express uncertainty about their accuracy (12-13). In a study of care home staff experiences of integrating lateral flow tests in routine practice participants were worried about the implications of inaccurate results such as false positives (14). For some participants in our study this was sufficient to influence decisions to not test, with concerns expressed in interviews regarding the individual and societal implications of false positive and false negative test results. However, others were not accessing LF testing as they perceived themselves to be at low risk of transmitting the virus to others, were following other government guidance at the time of the data collection (handwashing, social

distancing, wearing of face coverings), or believed that having received one or two doses of a COVID-19 vaccination they were at lower risk of infection.

Those who were testing suggested in survey responses that negative test results would not influence behaviours such as social distancing and wearing of face coverings, similarly to findings from research with university staff and students (11). However, testing was seen as a way to afford individuals peace of mind when interacting with others, including family and friends and those perceived to be more vulnerable to the effects of COVID-19 infection. In the Liverpool pilot evaluation 16% of respondents stated that they would also highlight the peace of mind given by testing if promoting testing to others, findings echoed elsewhere (11-12, 15). In fixed survey responses in the Birmingham survey more than half of participants stated that there were likely to see friends and family following a negative LFT result. Some interviewees who were testing or had tested were clear that despite knowledge that LFT accuracy was not perfect, they were using testing to 'green light' personal interactions. These findings differ from those of the Liverpool pilot scheme evaluation where only 4% of respondents to an Office for National Statistics (ONS) survey stated that they intended to carry out social activities following a negative test (5). In concordance with Blake and colleagues (12, 16) our findings indicate that behavioural intentions may have shifted as restrictions have gradually been eased, as testing has been utilised to enable a range of activities, and as the vaccination programme has progressed.

Furthermore, whilst survey respondents in school and workplace settings were more likely to report testing twice weekly according to government guidance, others reported testing on an occasional or ad hoc basis, associated with interactions outside of the immediate household. Elsewhere university students have given positive feedback about regular asymptomatic testing but also expressed a desire for reminders to do so (11). In care homes staff have been concerned about the additional impacts and stressors related to testing (14), and testing regimes were not well adhered to in a pilot scheme (17). In secondary school households approximately 10% of respondents stated that nobody, including school children were testing; 16% when including all school households. Again, reports of perceived poor test accuracy were implicated in these decisions. In households where children were testing, some parents were not testing and others were testing on an ad hoc basis. There were several reports of negative experiences when trying to undertake home testing of children, particularly regarding the comfort of testing. There has been speculation that implausibly low positive test rates in children at school may be caused by poor swab technique (18). It is probable that this may be moderated by improving test comfort. However, a pilot of primary school testing in Germany found that whilst parents were concerned about additional burden children suggested that testing was less burdensome than other restrictions, such as mask mandates (15).

Whilst there was some scepticism about population-level LF testing strategies amongst some participants who cited a political rather than scientific basis for testing, others suggested that screening for cases of COVID-19 can only be a good thing. These interviewees were in favour of test-to-do strategies, such as to attend events. A small number of participants did suggest that they were not engaging in testing due to the perceived risk and negative consequences of self-isolation on educational, work or family life. We would estimate that this is likely to be more prevalent at population level as this was a key theme emerging from the Liverpool evaluation. Other research with university students shows some avoidance of testing due to fears of self-isolation requirements or causing others to have to self-isolate (16, 19).

Limitations

Response to the survey was low, although the survey ran during a period of relatively low and falling rates of infection, hospitalisation and deaths (20), and during the early stages of a vaccination programme. Furthermore, we know from these data that the vaccination programme was one

reason for not taking a LFT, potentially limiting recruitment to the survey. The sample is not representative of the Birmingham population, being more predominantly female and of white ethnicity. Therefore, whilst the findings do illustrate diversity of views and behaviour in relation to LF testing response bias is the main issue with online surveys. The views of men and respondents of non-white ethnicity are under-represented in this sample and may be somewhat different to those described here. There were a number of university-based respondents to the survey which may have skewed some views regarding testing, for example where respondents were more familiar with the emerging evidence related to test accuracy. We also struggled to recruit students to the interview portion of this research and were reliant on relatively rapid conduct and analysis of interviews within a short timescale. However, we were able to focus on core analytical questions and use a team-based approach to analysis and interpretation.

CONCLUSION

These data demonstrate that whilst some people are choosing not to undertake lateral flow testing for asymptomatic COVID-19, others are doing so in order to provide the peace of mind needed to engage in personal interactions that they may otherwise avoid. This seems to be directly in tension with the initial justifications for population level screening using lateral flow tests. That is, their use as evaluated in the Liverpool pilot, to identify cases of COVID-19 and reduce transmission, without changing personal behaviours that might increase transmission risk. Indeed there seems to have been a significant policy drift in the use of LFTs in order to sanction activities – travel, visits to vulnerable relatives, and more recently testing to reduce the length of the COVID-19 self-isolation period. Positive LFT tests have also replaced confirmatory pcr tests for asymptomatic cases. The peace of mind described by participants in this research may well be a pre-requisite for people to more fully engage in activities they would otherwise be wary of. Many are engaging in lateral flow testing and despite expressed concerns regarding test accuracy, those who are doing so hold generally positive attitudes towards their continued use.

Acknowledgements

The authors would like to thank the study participants and also collaborators in Birmingham City Council and NHS Test and Trace who gave feedback on the survey design and facilitated survey distribution.

Funding statement

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests

The authors do not have any competing interests to declare.

Contributions

JM: Conception and design of research, creation of interview schedule, analysis, drafting of manuscript and findings, substantial revisions to manuscript. CP: Conduct of interviews, qualitative

analysis, quantitative analysis, drafting of findings, revisions to manuscript. DT: Creation of online survey, quantitative analysis, qualitative analysis, drafting of findings, revisions to manuscript. GR: Data analysis, critical appraisal of draft findings and manuscript. RP: Conduct of interviews, qualitative analysis, quantitative analysis, drafting of findings, revisions to manuscript.

Ethics

This study was granted ethical approval by the University of Birmingham Research Ethics Committee (ERN_21-0312).

Data availability statement

Data available from the authors upon reasonable request

Word Count: 5426

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Table 1 Interview sample characteristics

ID	Gender	Age	Occupation	Testing	Test setting*	Children (none/primary/secondary/both)	Secondary school age children testing
1	Female	20-24	Student	Yes	University	None	n/a
2	Female	50-54	School Support Worker	Yes	Home/School	Secondary	Yes
3	Male	70-74	Retired	No	n/a	None	n/a
4	Female	50-54	Auditor	Yes	Care home	None	n/a
5	Female	35-39	PA	Yes	Walk in and online	None	n/a
6	Female	75-79	Retired	Yes	Walk-in and online	None	n/a
7	Female	60-64	Care Assistant	Yes	Home	None	n/a
8	Female	20-24	School Support Worker	Yes	Home	None	n/a
9	Female	45-49	Manager	No	n/a	Secondary	No
10	Female	Data not provided	Register Nurse	Yes	Home/School	Secondary	Yes
11	Female	65-69	Teacher	Yes	Home	None	n/a
12	Female	50-54	University lecturer	Yes (once)	Walk-in	None	n/a
13	Female	50-54	Child-minder	Yes	Walk-in, online/School	Secondary	Yes
14	Female	35-39	Head Teacher	Yes	Home	Primary	n/a
15	Female	35-39	Manager	No	n/a	Primary	n/a
16	Female	40-44	Centre Manager	No	n/a	Primary	n/a
17	Female	45-49	Administrator	No	n/a	None	n/a
18	Female	55-59	Manager	No	n/a	None	n/a
19	Male	30-34	Assistant team manager	Yes	Walk-in	Primary	n/a
20	Male	40-44	Academic	Yes (once)	Walk-in/School	Secondary	Yes
21	Female	35-39	Office Manager	Yes	Home	Primary	n/a

* School = interviewee with secondary school age children who are testing regularly

Table 2. Test uptake

Test source	n (%)
Walk-in facility in Birmingham	59 (27)
Home ordering service in England	75 (34)
Neither	106 (48)
Total	**220**

Table 3. Test uptake/ intention to test

	University n (%)	Workplace n (%)
Already taken test	34 (66)	67 (70)
Intend to take test	9 (17)	12 (12)
No intention to test	9 (17)	17 (18)
Total	**52**	**96**

Table 4. Test uptake/ intention to test (in households with children in education)

Person taking test	**n (%)**
Respondent	9 (12)
Respondent/ Another adult	17 (22)
Respondent / Another adult/ Children	15 (19)
Respondent / Children	5 (6)
Another adult	4 (5)
Another adult/ Children	2 (3)
Children	13 (17)
None	12 (16)
Total	**77**

Table 5. Test regularity

	Walk-in n (%)	Home ordering n (%)	Nursery, School, College n (%)	University n (%)	Workplace n (%)
Regularly	20 (34)	53 (71)	39 (80)	12 (28)	66 (84)
Occasionally	23 (39)	12 (16)	9 (18)	25 (58)	12 (15)
Once	16 (27)	10 (13)	1 (2)	6 (14)	1 (1)
Total	**59**	**75**	**49**	**43**	**79**

Table 6. Test frequency

	Walk-in n (%)	Home ordering n (%)	Nursery, School, College n (%)	University n (%)	Workplace n (%)
≥3 weekly	0 (0)	2 (4)	0 (0)	0 (0)	1 (1)
2 weekly	9 (45)	39 (73)	31 (79)	3 (27)	62 (94)
1 weekly	8 (40)	11 (21)	7 (18)	7 (64)	3 (5)
<1 weekly	3 (15)	1 (2)	1 (3)	1 (9)	0 (0)
Total	**20**	**53**	**39**	**11**	**66**

Table 7. Experience of testing and reporting results		
Clarity of instructions n (%)	Very clear	65 (87)
	Slightly clear	6 (8)
	Neither	1 (1)
	Slightly unclear	3 (4)
	Very unclear	0 (0)
	Total	**75**
Difficulty of taking test n (%)	Very easy	45 (60)
	Slightly easy	13 (17)
	Neither	5 (7)
	Slightly difficult	9 (12)
	Very difficult	3 (4)
	Total	**75**
Difficulty of understanding test results n (%)	Very easy	72 (96)
	Slightly easy	1 (1.$\overline{3}$)
	Neither	1 (1.$\overline{3}$)
	Slightly difficult	1 (1.$\overline{3}$)
	Very difficult	0 (0)
	Total	**75**
Difficulty of reporting results n (%)	Very easy	30 (53)
	Slightly easy	16 (28)
	Neither	3 (5)
	Slightly difficult	6 (11)
	Very difficult	2 (3)
	Total	**57**

Table 8. Perception of test accuracy	
Accuracy	**n (%)**
Accurate	11 (5)
Somewhat accurate	153 (70)
Somewhat inaccurate	36 (16)
Inaccurate	15 (7)
Do not know	5 (2)
Total	**220**

SUPPLEMENTARY APPENDIX 1: SURVEY TOOL

Start of Block: Language

Welcome to the COVID-19 Lateral Flow Testing in Birmingham survey

1. Please choose your language
   - English
   - Additional languages as indicated by Birmingham City Council

End of Block: Language

Start of Block: Participant Information and Consent

Participant Information

Birmingham residents can get a Lateral Flow Test for COVID-19 at a walk-in facility, community pharmacy, workplace, their university or through their child's nursery, school or college. These tests are used to identify people who have COVID-19 but have no symptoms. We are interested in your views and experience of COVID-19 lateral flow testing, to help us understand how we can improve public information about, for example, how to access a test, when to take a test, what to do following a test result and the support available if people test positive. We are also interested in why people might choose to take a test or not. Please click on 'More info' below for information about participating in this survey.

More info [opens participant information sheet]

2. Please click here to confirm you have read all of the participant information

Informed Consent

If you are interested in participating in this survey, please read the following statements and indicate whether you would like to participate in the survey.

(1) I confirm that I have read and understood the Participant Information for this survey. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily.

(2) I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without my rights being affected. I understand that data collected up to my time of withdrawal may be used.

(3) I understand that my information will be held in accordance with current data protection regulations.

(4) I agree for the data I provide to be archived at the University of Birmingham. I understand that other authorised researchers will have access to this data only if they agree to preserve the confidentiality of the information as outlined here.

(5) The information I have submitted will be published anonymously (without identifying who provided it).

(6) I confirm that I am 18 years old or above.

(7) I agree to take part in this survey.

3. Please confirm whether you would like to participate in the survey.

- Yes, I have read the participant information and would like to participate in this survey
- No, I would not like to participate in this survey

End of Block: Participant Information and Consent

Start of Block: Walk-in

Walk-in Lateral Flow Testing

Please note, all answers will be anonymised before being published – we will not notify NHS Test and Trace of your personal responses.

Walk-in Lateral Flow Tests involve taking a nose and throat swab sample when you have no COVID-19 symptoms, without requiring an appointment.

4. Have you taken a COVID-19 Lateral Flow Test at a walk-in facility in Birmingham?
   - Yes
   - No

Display This Question:

If 4 = Yes

4.1. Where did you take your most recent walk-in Lateral Flow Test?
- Hippodrome
- Utilita Arena Birmingham (formerly NIA)
- Community Pharmacy
- Other

Display This Question:

If 4.1 = Yes

4.1.1. If you selected Other, please specify:

_____

4.2. How did you learn about walk-in Lateral Flow Testing in Birmingham? (Please select all that apply)
- Government coronavirus website
- Birmingham City Council website
- University
- School
- Work
- Television
- Local radio
- National radio
- Local newspaper
- National newspaper
- News website/app
- GP
- Other healthcare professional
- Friends and family

- Other people in your community
- Place of worship
- Social media
- Other

Display This Question:

If 4.2 = Other

4.2.1. If you selected Other, please specify:

_____

4.3. What were your reasons for getting tested at a walk-in facility? (Please select all that apply)

- To help reduce the spread of COVID-19 to others
- Reassurance of knowing whether I have COVID-19
- To protect people in my household/ bubble
- I need a test for my job
- I was exposed to someone with COVID-19
- Convenience of walk-in testing
- Because I am part of a household / childcare support bubble with a child, pupil or student at nursery, school or college
- Other

Display This Question:

If 3.5 = Other

4.3.1. If you selected Other, please specify:

_____

4.4. How regularly do you take a Lateral Flow Test at a walk-in facility in Birmingham?

- Once only
- Occasionally
- At regular intervals

Display This Question:

If 4.4 = At regular intervals

4.4.1. How often do you typically get a Lateral Flow Test at a walk-in facility in Birmingham?

	Less than once per week	Once per week	Twice per week	3 times per week	More than 3 times per week
I take a test					

4.4.2. What are your reasons for taking a Lateral Flow Test this regularly?

_____

_____

Display This Question:

If 4 = No

4.5. What are your reasons for not using a walk-in lateral flow test facility? (Please tick all that apply)

- I have received my initial vaccination for COVID-19
- I have received both doses of the COVID-19 vaccination
- A member of my household recently received a negative test
- I adhere to government guidelines (e.g., mask wearing, social distancing)
- I find the location of test facilities inconvenient
- I think the test is painful or uncomfortable
- I cannot or do not want to self-isolate after a positive test
- I fear infection after coming into close contact with others at a test facility
- It takes too much time to get tested
- I have already had COVID-19
- I do not believe there is a pandemic
- I do not trust government information
- I do not trust other information about COVID-19
- I do not have any symptoms of COVID-19
- I was not aware of walk-in lateral flow testing in Birmingham
- I am accessing lateral flow tests elsewhere (e.g., school or workplace)
- I do not think lateral flow tests are accurate
- Other

Display This Question:

If 4.6 = Other

4.5.1. If you selected Other, please specify:

_____

Display This Question:

If 4.6 = I cannot or do not want to self-isolate after a positive test

4.5.2. Please can you tell us more about why you could not or would not want to self-isolate after getting a positive test.

_____

4.6. Please tell us anything else you feel is relevant regarding Lateral Flow Testing at walk-in facilities in Birmingham.

_____

End of Block: Walk-in

Start of Block: School or College

Nursery, School and College Testing

If you are a member of a household with a child at nursery or preschool, or part of a childcare support bubble you are advised to get twice weekly lateral flow testing for COVID-19. Pupils and students at school and college are also being supplied with home test kits from their

school or college. The next few questions ask about who is taking tests within the household and the reasons for this.

5. Do you have a child or children currently attending one of the following, or are you part of a household or childcare support bubble that does? (Please tick all that apply)
   - Nursery or preschool
   - Primary school
   - Secondary school
   - College
   - None of the above

6. What is your relationship to the pupil(s) or student(s)?
   - Parent
   - Grandparent
   - Other

Display This Question:

If n = x

6.1. If you selected Other, please specify:

---

7. Who in your household or childcare support bubble has or intends to take up the offer of lateral flow testing? (Please select all that apply)
   - Me
   - Another adult
   - Children
   - None

Me / Another adult

Display This Question:

If n = Me / Another adult

7.1. Has another member of your household or childcare support bubble (not including yourself, pupils or students) already taken a Lateral Flow Test?
   - Yes
   - No

7.2. How do you get your tests for members of your household or childcare support bubble (not including pupils or students)? (Please tick all that apply)
   - We have collected lateral flow home test kits from one of the collection points in Birmingham
   - We have ordered home test kits online
   - We have chosen to get tested at walk-in lateral flow test sites in Birmingham, rather than at home

7.2.1. Please tell us about the reasons for your answer above.

Display This Question:

If n = We have collected lateral flow home test kits from one of the collection points in Birmingham / We have ordered home test kits online

7.3. How regularly do members of the household or childcare support bubble (not including pupils or students) take or intend to take an at-home Lateral Flow Test?

- Once only
- Occasionally
- At regular intervals

Display This Question:

If n = At regular intervals

7.3.1. How often do members of the household or childcare support bubble (not including pupils or students) take or intend to take an at-home Lateral Flow Test?

	Less than once per week	Once per week	Twice per week	3 times per week	More than 3 times per week
I take a test					

7.3.2. Why do members of the household or childcare support bubble (not including pupils or students) take or intend to take an at home Lateral Flow Test this often?

7.4. What are the reasons for members of the household or childcare support bubble (not including pupils or students) taking or intending to take a lateral flow test at home?

- To help reduce the spread of COVID-19 to others
- Reassurance of knowing whether I have COVID-19
- To protect people in my household
- I need a test for my job
- I was exposed to someone with COVID-19
- Convenience of at home testing
- Other

Display This Question:

If n = Other

7.4.1. If you selected Other, please specify:

Me

Display This Question:

If n = Me

7.5. Have you already taken a Lateral Flow Test?

- Yes
- No

Display This Question:

If n = Yes

7.5.1. How clear were the instructions for taking the test yourself?

	Very unclear	Slightly unclear	Neither	Slightly clear	Very clear
The instructions for taking the test were					

7.5.2. What, if anything, was unclear about the instructions for taking the test yourself?

_____

7.5.3. How difficult was it to take the Lateral Flow Test yourself?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Taking the test was					

7.5.4. What, if anything, was easy about taking the test?

_____

7.5.5. What, if anything, was difficult about taking the test?

_____

7.5.6. How difficult was it to understand the results?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Interpreting the test results was					

7.5.7. What, if anything, was difficult about understanding the results?

_____

Children

Display This Question:

If n = Children

7.6. How regularly do secondary or college students take or intend to take an at home Lateral Flow Test?

- Once only
- Occasionally
- At regular intervals

- Not applicable

Display This Question:

If n = At regular intervals

7.6.1. How often do secondary pupils or students take or intend to take an at home Lateral Flow Test?

	Fewer than once per week	Once per week	Twice per week	3 times per week	More than 3 times per week
I take a test					

7.6.2. Please explain why secondary pupils or students will take or have already taken a home Lateral Flow Test this often?

_____

7.7. Has a pupil or student in your household or childcare support bubble already taken a Lateral Flow Test?

- Yes
- No

Display This Question:

If n = Yes

7.7.1. How clear were the instructions for the pupil or student's test?

	Very unclear	Slightly unclear	Neither	Slightly clear	Very clear
The instructions for pupil or student's the test were					

7.7.2. What, if anything, was unclear about the instructions for the pupil or student's test?

_____

7.7.3. How difficult was it for the pupil or student to take the Lateral Flow Test?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Administering the pupil or student's test was					

7.7.4. What, if anything, was easy about the pupil or student's test?

_____

7.7.5. What, if anything, was difficult about the pupil or student's test?

_____

7.7.6. How difficult was it to understand the pupil or student's results?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Interpreting the test results was					

7.7.7. What, if anything, was difficult about understanding the pupil or student's results?

All

Display This Question:

If n = Me / Another adult / Children

7.8. How did you decide who in your household or childcare support bubble would take Lateral Flow Tests?

7.9. Do you report or intend to report your household's test results to NHS Test and Trace?

- Never
- Only if someone receives a negative test
- Only if someone receives a positive test
- Sometimes
- Every time someone takes a test

Display This Question:

If n = Only if someone receives a negative test / Only if someone receives a positive test / Sometimes / Every time someone takes a test

7.9.1. How difficult was it to report your household's test results to NHS Test and Trace?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Reporting the results of my test to NHS Test and Trace was					

7.10. Would you inform your child's school or college if someone in your household received a positive test?

- Yes
- No

Display This Question:

If n = No

7.10.1. Why not?

None

Display This Question:

If n = None

7.11. Please tell us why?

---

8. Please tell us anything else you feel is relevant regarding Lateral Flow Testing for people with children attending school or college.

End of Block: School or College

Start of Block: University

University Testing

9. Have you been offered or are eligible for a COVID-19 Lateral Flow Test through a University in Birmingham?
   - Yes
   - No
   - Don't know

Display This Question:

If 6 = Yes

10. Which University do you attend?
    - Aston University
    - Birmingham City University
    - Birmingham University
    - Newman University
    - University College Birmingham

11. Have you or do you intend to take up the offer of lateral flow testing through your University?
    - I have taken a test through my University
    - I intend to take a test through my University
    - No, I do not intend to take a test through my University

Display This Question:

If 8 = I have taken a test through my University / I intend to take a test through my University

11.1. How regularly do you take or intend to take a Lateral Flow Test at your University?
   - Once only
   - Occasionally
   - At regular intervals

Display This Question:

If 8.9 = At regular intervals

11.1.1. How often do you typically take or intend to take a Lateral Flow Test at your University?

	Less than once per week	Once per week	Twice per week	3 times per week	More than 3 times per week
I take a test					

11.1.2. Why do you take or intend to take a lateral flow test this often?

Display This Question:

If 8 = I have taken a test through my University

11.2. How clear were the instructions for taking the test?

	Very unclear	Slightly unclear	Neither	Slightly clear	Very clear
The instructions for taking the test were					

11.3. What, if anything, was unclear about taking the test?

11.4. How challenging was it to take the Lateral Flow Test?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Taking the test was					

11.5. What, if anything, was easy about taking the test?

11.6. What, if anything, was difficult about taking the test?

11.7. How difficult was it to interpret the results?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Interpreting the test results was					

11.8. What, if anything, was difficult about interpreting the results?

11.9. What were your reasons for getting tested through your University?

- To help reduce the spread of COVID-19 to others
- Reassurance of knowing whether I have COVID-19
- To protect people in my household
- I need a test for my job
- I was exposed to someone with COVID-19
- Convenience of testing at University
- Other

Display This Question:

If 8.8 = Other

11.9.1. If you selected Other, please specify:

_____

11.10. Do you report your test results to NHS Test and Trace?

- Never
- Only if I receive a negative test
- Only if I receive a positive test
- Sometimes
- Every time I take a test

Display This Question:

If 8.10 = Only if I receive a negative test / Only if I receive a positive test / Sometimes / Every time I take a test

11.10.1. How difficult was it to report your test results to NHS Test and Trace?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Reporting the results of my test to NHS Test and Trace was					

Display This Question:

If 8 = No, I do not intend to take a test through my University

11.11. What are your reasons for not getting tested through your University?

- I do not want to miss face-to-face teaching
- I have received my initial vaccination for COVID-19
- I have received both doses of the COVID-19 vaccination
- A member of my household recently received a negative test
- I follow government guidelines (e.g. mask wearing, social distancing)
- Inconvenient location of test facility
- I think the test is painful or uncomfortable
- I cannot or do not want to self-isolate after a positive test
- Fear of infection after coming into close contact with others at the test facility
- It takes too much time to get tested
- I have already had COVID-19
- I do not believe there is a pandemic

- I do not trust information about COVID-19
- I do not trust government information
- I do not have any symptoms of COVID-19
- I was not aware of lateral flow testing at my university
- I am accessing lateral flow tests elsewhere (e.g. walk-in site)
- I do not think the tests are accurate
- Other

Display This Question:

If 8.11 = Other

11.11.1. If you selected Other, please specify:

_____

Display This Question:

If 8.11 = I cannot or do not want to self-isolate after a positive test

11.11.2. Please can you tell us more about why you could not or would not want to self-isolate after getting a positive test.

_____

12. Please tell us anything else you feel is relevant regarding Lateral Flow Testing for students in a University.

_____

End of Block: University

Start of Block: Workplace

Workplace Testing

13. Have you been offered or are eligible for a COVID-19 Lateral Flow Test through your workplace?
    - Yes
    - No
    - Don't know

14. Have you or do you intend to take up the offer of lateral flow testing through your workplace?
    - I have taken a test through my workplace
    - I intend to take a test through my workplace
    - No, I do not intend to take a test through my workplace

Display This Question:

If 10 = I have taken a test through me workplace / I intend to take a test through my workplace

14.1. How regularly do you take or intend to take a Lateral Flow Test at your workplace?
    - Once only

- Occasionally
- At regular intervals

Display This Question:

If 10.9 = At regular intervals

14.1.1. How often do you typically take or intend to take a Lateral Flow Test at your workplace?

	Less than once per week	Once per week	Twice per week	3 times per week	More than 3 times per week
I take a test					

14.1.2. Why do you take or intend to take a lateral flow test this often?

_____

Display This Question:

If 10 = I have taken a test through me workplace

14.2. How clear were the instructions for taking the test?

	Very unclear	Slightly unclear	Neither	Slightly clear	Very clear
The instructions for taking the test were					

14.3. What, if anything, was unclear about taking the test?

_____

14.4. How difficult was it to take the Lateral Flow Test?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Taking the test was					

14.5. What, if anything, was easy about taking the test?

_____

14.6. What, if anything, was difficult about taking the test?

_____

14.7. How challenging was it to interpret the results?

	Very difficult	Slightly difficult	Neither	Slightly easy	Very easy
Interpreting the test results was					

14.8. What, if anything, was difficult about interpreting the results?

14.9. What were your reasons for getting tested through your workplace?

- To help reduce the spread of COVID-19 to others
- Reassurance of knowing whether I have COVID-19
- To protect people in my household
- I need a test for my job
- I was exposed to someone with COVID-19
- Convenience of testing at my workplace
- Testing is mandatory in my workplace
- Other

Display This Question:

If 10.8 = Other

14.9.1. If you selected Other, please specify:

Display This Question:

If 10 = No, I do not intend to take a test through my University

14.10. What are your reasons for not getting tested through your workplace?

- I have received my initial vaccination for COVID-19
- I am received both doses of the COVID-19 vaccination
- A member of my household recently received a negative test
- I adhere to government guidelines (e.g. mask wearing, social distancing)
- Inconvenient location of test facility
- I think the test is painful or uncomfortable
- I cannot or do not want to self-isolate after a positive test
- Fear of infection after coming into close contact with others at the test facility
- It takes too much time to get tested
- I have already had COVID-19
- I do not believe there is a pandemic
- I do not trust information about COVID-19
- I do not trust government information
- I do not have any symptoms of COVID-19
- I was not aware of lateral flow testing at my workplace
- I am accessing lateral flow tests elsewhere (e.g. walk-in site)
- I do not think lateral flow tests are accurate
- Other

Display This Question:

If 10.12 = Other

14.10.1. If you selected Other, please specify:

Display This Question:

If 10.12 = I cannot or do not want to self-isolate after a positive test

14.10.2. Please can you tell us more about why you could not or would not want to self-isolate after getting a positive test.

---

15. Would you inform your workplace if someone in your household received a positive test?
    - Yes
    - No

Display This Question:

If 10.10 = No

15.1. Why not?

---

16. Please tell us anything else you feel is relevant regarding Lateral Flow Testing via the workplace.

End of Block: Workplace

Start of Block: Test Results

Test Results

17. What was your most recent COVID-19 Lateral Flow Test result?
    - Positive
    - Negative
    - Void
    - I have not received my test result
    - I have not taken a test

18. Whether you have received test results or not, put yourself in the mindset of having received a **negative** test result for COVID-19. If you have a **negative** test result for COVID-19, how do you think this affects your risk of passing on the virus to others?

	Much lower	Slightly lower	Unchanged	Slightly higher	Much higher
My risk of passing on COVID-19 is					

18.1. Please tell us why.

18.2. If you received a **negative** test result, how likely are you to do the following?

	Very unlikely	Unlikely	Neither	Likely	Very likely
Go shopping					

Visit friends or family					
Get closer than 2m to friends and family outside of your household or social bubble					
Go for walk or exercise outdoors					
Wear a face covering while in enclosed spaces					
Wash your hands often and for longer					
Ventilate rooms that you share with other people					

18.3. Which statement below best describes what a **negative** test result means?

- I am definitely not infectious
- I am probably not infectious
- I am probably infectious
- I am definitely infectious
- I do not know

19. Whether you have received test results or not, put yourself in the mindset of having received a **positive** test result for COVID-19. If you have a **positive** test result for COVID-19, how do you think this affects your risk of passing on the virus to others?

	Much lower	Slightly lower	Unchanged	Slightly higher	Much higher
My risk of passing on COVID-19 is					

19.1. Please tell us why.

19.2. If you received a **positive** test result how likely are you to do the following?

	Very unlikely	Unlikely	Neither	Likely	Very likely
Go shopping					
Visit friends or family					
Get closer than 2m to friends and family outside of your household or social bubble					
Go for a walk or exercise outdoors					
Wear a face covering while in enclosed spaces					
Wash your hands often and for longer					

Ventilate rooms that you share with other people					
Self-isolate					
Get a PCR (laboratory) test to confirm the positive result					
Take another lateral flow test to confirm the positive result					

19.3. Which statement below best describes what a **positive** test result means?

- I am definitely not infectious
- I am probably not infectious
- I am probably infectious
- I am definitely infectious
- I do not know

20. Which statement below best describes your views regarding lateral flow tests?

- They are accurate
- They are somewhat accurate
- They are somewhat inaccurate
- They are inaccurate
- I do not know

21. Please tell us anything else that you think is relevant about lateral flow test results.

_____

End of Block: Test Results

Start of Block: Demographics

Demographics

Your details will help us to understand what parts of our community have responded to the survey and consider how best to target public information about COVID-19 testing in the future.

22. Please provide the first part of your postcode.
For example, B1 or B74.

_____

23. What is your occupation?

_____

24. What is your age?

_____

25. What gender do you most identify with?

- Female
- Male
- Non-binary

- Prefer not to say
- Other

Display This Question:

If 18 = Other

25.1. If you selected Other, please specify:

_____

26. Which of the following best describes your ethnicity?
- Asian/ Asian-British- Indian, Pakistani, Bangladeshi, other
- Black/ Black British- Caribbean, African, other
- Mixed race- White and Black/ Black British
- Mixed race- other
- White- British, Irish, other
- Chinese/ Chinese British
- Middle Eastern/ Middle Eastern British- Arab, Turkish, other
- Prefer not to say
- Other

Display This Question:

If 19. = Other

26.1. If you selected Other, please specify:

_____

27. Do you live alone?
- Yes
- No

End of Block: Demographics

Start of Block: Follow-up Interviews

Follow-up Interviews

28. Would you be willing to speak over the phone with one of the researchers on our team to discuss your views on testing in more detail?
- Yes
- No

Display This Question:

If 22. = Yes

29. If you would be happy to speak with one of our researchers, please provide your name which we will use when contacting you.

_____

30. Please provide your email address so that we can contact you to arrange an interview.

_____

31. Please provide your phone number so that we can contact you to arrange an interview.

_____

End of Block: Follow-up Interviews

Start of Block: Survey Receipt and Screening

End

Display This Question:

If 3 = Yes

Thank you for your time. Your responses to this survey have been submitted. You may now close this page.

Display This Question:

If 3 = No

Thank you for your time. Please click here for information about COVID-19 Lateral Flow Testing in Birmingham. You may now close this page.

SUPPLEMENTARY APPENDIX 2: INTERVIEW SCHEDULE

Prior to interview

Note the reason for speaking to this interviewee based on the sampling criteria grid and identify which sections are relevant to this interviewee.

Review responses to survey prior to interview inc. free text. to help with the above. Note these down in the relevant sections in preparation to help with interview conduct / management. e.g. the reasons they have indicated in the survey that they refused testing. These will be used in opening questions in each section i.e. checking back / reminding interviewee of survey responses.

Introduction and opening remarks

1.) Introduce self and tell participant you will begin recording- specify recording will be done using a Dictaphone, rather than through third party software i.e. Zoom/Skype.
2.) Achieve informed consent verbally, take participant through information sheet and consent form, ensuring participant is aware of the broad aims of the study, and their rights as research participants. Check off consent statements during verbal consent.
3.) Ensure the participant is comfortable to begin the interview and give them the opportunity to ask any questions before beginning.
4.) Briefly orientate participant to topics you would like to discuss – follow up regarding responses to lateral flow test survey (will be participant specific).

Start of interview;

Briefly check – interviewee's circumstances and which lateral flow test offers are relevant to them e.g. may have indicated they do or don't have children, are not eligible for workplace or uni – confirm this as a way of starting and then to move on to next relevant section e.g. establishing how many children in household / age (survey responses give some of this info).

(1) REASONS FOR UPTAKE / NON-UPTAKE OF TESTING, INCLUDING SETTING SPECIFIC REASONS

If refused testing / no intention to test:

Relevant survey responses _____

You indicated in the survey that ……..

Can you describe in a bit more detail the reasons why you / your household have decided against taking a lateral flow test?

Probe around decision-making processes based on response e.g. any family member/colleague/friend encouragement/discouragement/research undertaken/any media influence/ knowledge of government guidance etc.

If household (school testing) probe around who made the decision e.g. joint decision between parents / family?

Additional prompts;

Is there anything that might make you consider lateral flow testing in the future?

If testing / intending to test-

Relevant survey responses _____

You indicated in the survey that ……..

Can you describe in a bit more detail the reasons why you / your household have decided to take a lateral flow test/s?

Probe around decision-making process i.e. any family member/colleague/friend encouragement/discouragement/research undertaken/any media influence.

If household (school testing) probe around who made the decision e.g. joint decision between parents / family?

Additional prompts;

Is there anything that might make you reconsider lateral flow testing in the future e.g. stop you wanting to test?

(2) PATTERNS OF TESTING BEHAVIOUR AND UNDERPINNING RATIONALE – WHO WITHIN HOUSEHOLDS (SCHOOLS PARTICULARLY), FREQUENCY OF TESTING, TEST REPORTING

Frequency of testing

Survey responses _____

You indicated in the survey that …….

Can you describe in a bit more detail the reasons why you / your household have decided to take a lateral flow test/s this often?

Probe around decision-making process e.g. following government guidance, any family member/colleague/friend encouragement/discouragement/research undertaken/any media influence.

If household (school testing) probe around who made the decision e.g. joint decision between parents / family?

If testing is twice-weekly as advised – note this and explore why

If testing is not twice-weekly as advised – indicate that guidance is to test twice-weekly and explore reasons for different frequency of testing

If household / school testing and different frequency of testing explore why

Who within households

Survey responses _____

As above

Test reporting

Survey responses _____

As above

(3) EXPERIENCE OF TESTING - LACK OF CLARITY / DIFFICULTY

Survey responses _____

You indicated in the survey that ……..

Can you tell me a bit more about this / describe in a bit more detail

What was unclear?

Is there anything that would have helped / made things better?

Would this deter / prevent you from testing in the future?

Is there anything that could be improved?

(4) POST-TEST BEHAVIOURAL INTENTIONS – TEST RESULT SPECIFIC

-ve result survey responses _____

Probe re above

+ve result survey responses _____

Probe re above

Additional prompts

Have or has a negative or series of negative results influenced your adherence to current or past guidelines, for example, around social distancing or gatherings?

How would a positive lateral flow test impact your life? Probe around daily activities, work implications, mental health, any support needs whilst isolating, childcare whilst isolating.

(5) TEST PERCEPTIONS – MEANING OF –VE AND +VE TEST RESULTS, PERCEPTIONS OF TEST ACCURACY

Meaning of –ve and +ve test results

Negative – survey response _____

Probe about why they feel a negative test indicates this e.g. definitely don't have COVID

Positive – survey response _____

Probe about why they feel a positive test indicates this e.g. definitely have COVID

Perceptions of test accuracy

Survey responses _____

Probe about response

(6) OVERARCHING VIEWS OF POPULATION TESTING STRATEGIES WITH LFTs

1) How useful do you feel lateral flow testing is as a tool to reduce COVID-19 infections?- Probe around R-rate reduction, accuracy perceptions.
2) How do you think a lateral flow test differs from symptomatic testing/PCR testing? – Probe around swiftness of results, process, accuracy, how comfortable they feel self-testing.
3) How would you feel about having to 'do' a lateral flow test to participate in things or go somewhere? probe around -sporting venues, international travel, music festivals?

Summary questions

4) In summary, what do you feel the strengths of lateral flow testing are?
5) Weaknesses?
6) Are there any ways you think improvements to lateral flow testing strategies and information resources could be made?

Closing comments

- Ask if any further questions or comments from participant and address these
- Offer to provide summary of findings when available via e-mail
- Thank participant for time and ideas
- Switch off recorder and end interview