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NEWS ANALYSIS

Covid-19: Government ramps up "Moonshot" mass testing

With covid diagnostic testing set to be rolled out across England, **Gareth Iacobucci** examines the latest developments

Gareth Iacobucci

Last week the UK government announced that 67 more areas in England will be given access to rapid diagnostic tests for covid-19 in a major expansion of its Operation Moonshot mass testing programme.[1]

Manchester, Newcastle, Birmingham, Bristol, and parts of London will be among the areas (box 1) given access to lateral flow tests, which give results in 10 to 30 minutes, to test asymptomatic populations for covid-19. The expansion follows a pilot of mass testing in Liverpool that began on 6 November.[2]

Box 1: The 67 areas in England set to get mass testing

- Barking and Dagenham
- Bexley
- Birmingham
- Blackburn and Darwen
- Blackpool
- Bolton
- Brent
- Bristol
- Bury
- Calderdale
- Camden
- City of London
- County Durham
- Coventry
- Darlington
- Doncaster
- Dudley
- East Riding of Yorkshire
- Enfield
- Essex
- Gateshead
- Greenwich
- Hackney
- Halton
- Hammersmith and Fulham
- Hartlepool
- Hertfordshire
- Kingston upon Hull
- Islington
- Kensington and Chelsea
- Kingston upon Thames
- Knowsley
- Lambeth
- Lewisham
- Luton
- Manchester
- Middlesbrough
- Newcastle upon Tyne
- Newham
- North Tyneside
- Northumberland
- Nottingham City
- Nottinghamshire
- Oldham
- Redbridge
- Redcar and Cleveland
- Richmond upon Thames
- Rochdale
- Salford
- Sefton
- South Tyneside
- Southwark
- St Helen's
- Staffordshire
- Stockport
- Stockton-on-Tees
- Sunderland
- Tameside
- Tower Hamlets
- Trafford
- Wakefield
- Waltham Forest
- Wandsworth
- Warrington
- Wigan
- Wirral
- Wolverhampton

The latest figures, shared with *The BMJ*, show that as at 16 November the Liverpool pilot had tested 100 000 asymptomatic people, of whom 700 (0.7%) tested positive for covid-19 (box 2).

Box 2: How is Liverpool's pilot working?

In the first 10 days of mass testing in Liverpool 100 000 asymptomatic people were tested across 34 sites. Of this group, 700 (0.7%) tested positive for covid-19. The pilot has expanded to include children and adolescents, and there are now 48 sites in the Liverpool City Region, open from 7 am to 7 pm.

Liverpool's director of public health, Matt Ashton, said the pilot was measuring the number of people tested, the number of positives identified, and operational metrics such as how queues for tests work, how the testing process works, and turnaround times. Infection rates are also being monitored, he added, with an expectation that they will rise initially because of the case finding nature of mass testing but subsequently decrease.

The government has also started rolling out twice weekly testing for all NHS staff,[3] and it is planning to introduce mass testing of students between 30 November and 6 December.

England's health secretary, Matt Hancock, said NHS Test and Trace would be sending out 600 000 lateral flow tests to directors of public health, enabling each area to test 10% of its population a week. The devolved nations will also have the capacity to test 10% of their populations each week.

"Mass testing is a vital tool to help us control this virus and get life more normal," Hancock said.

Benefits versus costs

But some experts remain sceptical about the effectiveness and the ethics of mass testing.

Allyson Pollock, professor of public health at Newcastle University, said there was "insufficient evidence" for rolling out what amounted to an "extraordinary experiment across the whole of England where the purpose is far from clear."

She added, "Normally, if you were going to do a screening programme like this, you would start by asking the advice of the UK National Screening Committee . . . to understand what the feasibility is and to try to get some handle on the harms, the benefits, and the costs."

Pollock said, "We do not know, based on current evidence, whether screening the general population for SARS-CoV-2 will increase or decrease disease transmission, hospitalisations, and deaths. Detection and isolation of asymptomatic cases could potentially decrease disease transmission, but false reassurance from missed cases could potentially increase transmission, if people then engage in more risky behaviour."

Mass screening proposals also risk causing harm through "significant diversion of healthcare resources," she added.

But Matt Ashton, director of Public Health in Liverpool, said, "In the middle of a pandemic with technology developing rapidly, I think you have to try things. This is not going to be a perfect scientific experiment; it's not a well designed screening programme at a national level. It's a pilot to test out new approaches"

Ashton said the pilot's purpose was to try to identify where the virus was in Liverpool and to cut chains of transmission. It would also provide national learning about how mass testing works, how the test itself works, and where it could be most effective.

Performance of the tests

Liverpool is using the Innova lateral flow tests, which the government has spent £500m on procuring.

However, one concern is that although lateral flow tests are rapid they are not as good as polymerase chain reaction (PCR) testing. An interim evaluation by Public Health England's Porton Down laboratory and the University of Oxford that compared lateral flow antigen tests with PCR tests found that, overall, the Innova lateral test detected covid-19 in 76.8% of cases.[4] But performance varied in different settings. It detected 79.2% (95% confidence interval 72.8% to 84.6%) of cases when done by laboratory scientists, 73% (64.3% to 80.5%) when done by trained healthcare workers, but only 58% (52.3% to 62.6%) when done by self-trained members of the public.

The evaluation also reported a 0.32% false positive rate from lateral flow tests across several studies analysed.

Jon Deeks, professor of biostatistics at Birmingham University, said, "While this is a very low rate, the numbers of false positives can still outnumber the number of cases detected when used in mass screening where very few will have the virus. For example, if 100 000 people are tested in a city where the prevalence of covid is 400 per 100 000, assuming the Innova test has a sensitivity of 58% and specificity of 99.6% (as per the testing centre performance), these figures predict the test will give 630 test positives. However, only 230 of these will have covid; 400 of them will be false positives."

He added, "The poor detection rate of the test makes it entirely unsuitable for the government's claim that it will allow the safe 'test and release' of people from lockdown and students from university."

Deeks said the evidence "raises serious concerns that the benefits are likely to be few, with serious risks of harm from the public being misled by the unjustified claims of high performance of this test from the government."

Ashton said that Liverpool was sending confirmatory PCR testing by post to people who tested positive on the lateral flow test and was carrying out daily quality assurance tests to understand the performance of the Innova test. "We know that no test is perfect. You will get false positives and false negatives. In terms of false negatives, we're in a national lockdown and our information is quite clear that people aren't allowed to behave differently as a result of that negative test," he said.

Mass testing of students

The government has proposed a mass testing programme for students to enable them to return home to their families this Christmas while minimising the risk of spreading the disease. England's NHS Test and Trace will distribute lateral flow tests, with priority given to areas with higher rates of covid-19.

Some universities such as Oxford and Durham are already trialling their own rapid lateral flow testing arrangements.[5]

Pollock said she was opposed to universities participating in pilots that lacked study protocols. "Universities are meant to be the heart of academic integrity and good science," she said. "This is a huge experiment, and universities should not be rolling this out."

But Jacqui Ramagge, executive dean for science at Durham University, who has been overseeing Durham's pilot for rapid testing of students and staff (box 3), said there was a "balance to be had" when testing new approaches.

Box 3: Piloting rapid flow testing at Durham University

Durham University has been mass testing using lateral flow tests since 26 October. Unlike other university pilots, it has trained students and staff to self-administer the tests. It was initially rolled out to two of Durham's 17 colleges, and the university eventually plans to test

everybody who wishes to be tested once a week. Jacqui Ramagge, executive dean for science, who has been overseeing a pilot, said it had been set up to evaluate service delivery. This means that testing and entering of results is voluntary, and the number of voids, positives, or negatives is not known. Ramagge said, "The [lateral flow] devices have been validated. The question is around how often they should be used and how confident one is that one is still negative even after taking a test. No test grants you immunity. Students who tested positive were asked to seek a confirmatory PCR test. We have behavioural psychologists working with us, and clearly communications to students are vital."

"Our pilot is not a research exercise. It's a service evaluation which is primarily aimed at identifying the logistical and other impediments to running at scale," she said.

"Until we have a vaccine, mass testing seems to be the best solution, particularly with certain demographics where there's a higher prevalence of asymptomatic cases."

Large contracts out to tender

The government seems determined to press ahead with mass testing and has invited bidders to apply for three tenders, worth £43bn in total, to help deliver rapid testing across the country.[6] One of these tenders is for a contract worth £912m to supply lateral flow tests.[7]

Pollock voiced dismay at these figures. "It is a scandalous use of money and public funds to be awarding these contracts without good evidence that the tests work," she said.

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2 Iacobucci G. Covid-19: Mass population testing is rolled out in Liverpool. *BMJ* 2020;371:m4268. doi: 10.1136/bmj.m4268 pmid: 33144291

3 Rimmer A. Covid-19: NHS staff express scepticism over promised twice weekly testing. *BMJ* 2020;371:m4376. doi: 10.1136/bmj.m4376 pmid: 33177043

4 Preliminary report from the Joint PHE Porton Down & University of Oxford SARS-CoV-2 test development and validation cell: rapid evaluation of lateral flow viral antigen detection devices. 8 Nov 2020. https://www.ox.ac.uk/sites/files/oxford/media_wysiwyg/UK%20evaluation_PHE%20Porton%20Down%20%20University%20of%20Oxford_final.pdf.

5 Rapid covid test to be trialled at Merton and St Hilda's Colleges. 3 Nov 2020. Oxford Student. 3 Nov 2020. https://www.oxfordstudent.com/2020/11/03/rapid-covid-test-to-be-trialled-at-merton-and-hildas-colleges.

6 Gross A, Bounds A. UK government to pump up to £43bn into Covid testing. *Financial Times*. https://www.ft.com/content/07f76b06-73db-4647-97b6-ef0a9a58626d.

7 Lateral flow technology testing solutions [Notice]: bidstats. https://bidstats.uk/tenders/2020/W46/738590726.