

Covid-19 INNOVA testing in schools: don't just test, evaluate

Using testing to manage classroom outbreaks, without isolating close contacts, risks increasing disease spread, say these authors

Everybody wants schools to reopen when it is safe to do so, but for pupils, teachers, and their communities to remain safe they must stay close to covid free. Last term, schools limited pupil mixing and activities, and isolated pupil groups at home once a covid-19 case was identified, although many struggled with the lack of clear guidance. This term the government is planning to rely on INNOVA rapid lateral flow tests to mass screen staff and pupils, and serial test close school-contacts of covid cases. [1]

The proposed strategies were announced to schools on the last day of term before the Christmas break, providing no time for schools to scrutinise and discuss their scientific basis, or to organise how the lateral flow test policy will be delivered. Lockdown now provides an opportunity to do this, albeit some schools have already started using tests in keyworkers' children who continue to attend.

There are two different components to the government's testing plan. The first, mass testing of staff and pupils on return and twice weekly thereafter, aims to detect individuals who have asymptomatic or pre-symptomatic infection. Using the test to identify infected individuals who successfully isolate and prevent onward transmission is a clearly good outcome. However, there are three questions to ask: first, whether other testing strategies could produce better outcomes; second, could the same or fewer resources be more effectively used in other ways to contain infection; and third, whether there are likely to be unintended consequences of testing which could counter any benefit.

Scientists have particular concerns that negative INNOVA results are too inaccurate to rule out Covid. The Medicines and Healthcare products Regulatory Agency (MHRA) authorisation for INNOVA excludes using negative results to "enable activity" [2], and the Chief Medical Officer [3], World Health Organization [4], Royal College of Pathologists [5], SAGE [6], and others [7] have likewise advised caution. Mass testing could backfire and increase transmission if individuals receiving negative test results are falsely reassured that they cannot have covid infection, and consequently take risks and reduce preventative behaviours. In a Department of Education video from one school where mass testing was piloted, every student and one member of staff stated that the main benefit of testing to them was to feel safe, showing false reassurance and little understanding of this important limitation [8]. This misunderstanding is unsurprising since the version of the government's handbook for schools sent out in December stated: "These tests work ... they were shown to be as accurate in identifying a case as a PCR test" [1]. The strategy would have a chance if this were true, but this is incorrect. As the same wording was included in a template letter for schools to use, it has been widely shared with pupils and parents [9]. The Department of Education has now removed the letter and updated guidance, but the update to the handbook is still misleading, starting with the statement "These tests are very accurate ..." [10] and no correction has been issued to pupils and parents.

There is an even greater risk that the second part of the strategy, serial-testing of close contacts, may increase rather than decrease covid cases in schools. Consider a pupil who

shows symptoms, tests positive at a test-and-trace centre, and isolates at home. Their close school contacts continue to attend school and are tested for seven days, only sent home if INNOVA results are positive. The possibility that some close contacts who are infected will test negative and will spread the virus is not negligible. Any clinically vulnerable pupils or staff in the class will be put at particularly high risk. This proposed strategy is, in effect, using negative INNOVA results to enable pupils to remain in school contrary to the MHRA restriction and scientific advice.

In fact there are no evaluations of how well INNOVA detects cases in schools. Public Health England (PHE) and the University of Oxford used INNOVA in over 3,000 pupils in four schools, but crucially, did not evaluate to see if INNOVA testing had missed cases. [11] Other government-supported pilot school studies of INNOVA and of the saliva LAMP test [12] have the same design blind-spot.

There are now six studies that provide evidence of how well INNOVA identifies cases compared with the “gold standard” PCR test done at the same time. Three are in people with symptoms: the manufacturer detected 96% (95% confidence interval: 89% to 99%) of cases in patients hospitalised with pneumonia [13]; PHE reported two studies in test-and-trace centres: one used experienced research nurses and laboratory scientists and detected 77% (72% to 81%) of cases, the other used test-and-trace centre staff and detected 58% (52% to 63%) [11]. These results show test performance declining when not done by experts, as will happen in schools.

But pupils tested in schools will not have symptoms: three studies in symptomless people show the test as performing worse. In Liverpool, only 40% (29% to 52%) [14] and in University of Birmingham students only 3% (1% to 16%) of cases were detected. [15] Testing during an outbreak in a naval barracks by PHE detected only 28% (16% to 43%) of cases [11]. Other lateral flow tests have also shown poorer performance in asymptomatics. [16]

Lateral flow tests only detect cases when there are substantial quantities of virus on the swab. During an infection viral levels initially rise over several days as the virus proliferates, reach a peak (possibly coinciding with symptom onset), and fall once the individual's immune system successfully tackles the infection. Lateral flow tests only have a chance of detecting the infection around the peak but, even then, they miss cases (a third with the highest viral levels in Liverpool [14]).

Cases are infectious before they are symptomatic: thus, there is a real risk – that the government strategy aims to address - that infected people transmit the virus before becoming symptomatic. But while mass testing with INNOVA will detect some of these cases, it will miss many, and falsely reassure those testing negative, if they are not properly informed of the test's limitations. Eight of every thousand testing negative in both Liverpool and Birmingham were positive on PCR [14,15] and two of every 1000 in Liverpool had high viral levels. Accordingly, the MHRA exceptional use approval restricts use of INNOVA to find positive cases, and explicitly **not** to enable people to undertake activities based on a negative result [2].

Quite apart from the practicality of implementing such a resource intensive approach, schools and pupils must be provided with accurate information to ensure that they do not

inadvertently increase risk. Implementation should not happen without rigorous evaluations, which compare these strategies with other testing options, such as the use of PCR test-to-release after 5 days (as required for travellers [17]) for testing contacts, or pooled PCR testing (as successfully used at the University of Cambridge [18]) for identifying new cases. It is essential to check whether each strategy's benefits outweigh its harm, particularly with the increased transmission risk of the new variant. No testing strategy diminishes the need for the range of other interventions required to help make schools "safer"[19].

Home isolation impacts hard on children, families, and teachers. But if INNOVA testing in schools risks spreading the disease more widely, it may lead to even more disruption to education and putting many more people at risk. Don't just test, evaluate.

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Conflicts of interest

Jon Deeks leads the Cochrane covid-19 test evaluation reviews, is a member of the Royal Statistical Society covid-19 task force steering group, and co-chair the RSS working group on diagnostic tests. Mike Gill has no conflicts of interest. Sheila Bird is a member of the Royal Statistical Society's COVID-19 Taskforce and chairs its panel on test and trace. Sylvia Richardson is Director of the MRC Biostatistics Unit, President of the Royal Statistical Society and co-chair of the Royal Statistical Society Covid-19 Task Force. Deborah Ashby is Director of the School of Public Health, Imperial College London and Past President Royal Statistical Society. DA is investigator on the REACT study led by Imperial College, and co-chair of the RSS Diagnostic Test Working Group