

## Stopping the lockdown and ending the epidemic by universal weekly testing: an exit strategy

10<sup>th</sup> April 2020

Dear Mr Dominic Raab, Sir Keir Starmer, Mr Jeremy Hunt, Mr Matt Hancock, Mr Jonathan Ashworth, Professors Sir Patrick Vallance, Chris Whitty and John Newton,

The British public have so far been offered the strategy of alternating periods of lockdown and relaxation of restrictions. However, extended periods of lockdown will increase economic and social damage, and periods of relaxation of restrictions are almost certainly going to trigger further epidemic waves of fatalities. We strongly support expanding testing as quickly as possible, building up local public health teams to get our systems in place for case detection and contact tracing. We note however that asymptomatic and pre-symptomatic transmission may be a major factor in the epidemic. The resurgence can be slowed by contact tracing, behavioural changes and various degrees of physical distancing but it cannot be stopped. These cycles will kill tens and perhaps hundreds of thousands of people before a vaccine becomes available, and the most disadvantaged will suffer most.

As experienced public health researchers and practitioners we believe there is an alternative strategy that can restore normal life and economic recovery: universal repeated testing. We strongly recommend evaluation of weekly Covid-19 antigen testing of the whole population in an entire city as a demonstration site (preferably several towns and cities if funding is available), with strict household quarantine following a positive test. Visitors are allowed but are quarantined on arrival. Quarantine ends when all residents test negative at the same time. Lockdown will end immediately for everyone else, although some may choose to remain isolated. This should be assessed for feasibility in one or more cities with populations of ~200,000. Ending lockdown with weekly testing is likely to suppress viral transmission while restoring normal life. Such a feasibility study could begin immediately with Government support. The study will have begun after lockdown so the initial infection rate will be fairly low. The rate at which it then rises or falls will be apparent within a few weeks. A decision can then be taken on national roll-out, beginning in high-risk areas and limited only by reagent supplies. If this works hundreds of thousands of lives of people living in the UK may be saved, not to mention NHS intensive care overload and the miseries of lockdown and unemployment. The site(s) should be selected in consultation with local health and administrative authorities. Public awareness and implementation will be organised by a community advisory committee led by local public health specialists and PHE consultants in communicable disease control. To establish the feasibility of national roll-out all tests will be performed by staff in local academic or commercial labs with PCR machines currently used for other purposes. A city of 200,000 with 90% compliance will require 26,000 tests per day, plus a small increase to offer daily antigen testing for NHS staff and care workers. Such a study can be done without encroachments on privacy rights and with the consent of the population. Other requirements for the feasibility study are a population register of the city, self-sample kits and a system for delivering and collecting samples (see below).

Whatever the results these data will enable policy to be based on real-time evidence (instead of modelling assumptions) on new infection rates in the expanding regularly tested population and the untested remainder. The latter can be monitored by testing population

samples as well as by NHS number linkage to hospital diagnoses and GP records. Complementary and alternative strategies including contact tracing and mobile phone apps will be particularly important in the unscreened population, and may enable testing to be done less frequently as prevalence falls. Local public health staff supported by volunteers will assist in developing, implementing and evaluating these as well as supporting public information, home visits and helplines. To minimise disruption, access to the city would be unrestricted with occasional testing of incomers at temporary checkpoints. Testing would be voluntary, but imposing penalties for breaching quarantine following a positive test in a household could be considered. Helplines would be provided for quarantined households for exemption requests, loss of income compensation and food delivery.

### National roll-out

If the epidemic is controlled without lockdown in the feasibility study, public pressure for national roll-out will be irresistible. A ballpark cost-benefit analysis shows a total cost per year following national roll-out of £14 billion, the most speculative components being £100 million to expand facilities for manufacturing reagents and £2 per test for PCR reagents (£7 billion per year for 10 million tests per day). This is a small fraction of the economic costs of lockdown. Chemical manufacturers rather than clinical test companies must be involved to limit costs and ensure supplies. Quality control can be minimal because PCR is sensitive and any false negatives tend to be the least infectious cases, and because both false negatives and false positives will be retested a week later.

Universal repeat testing has been dismissed as impractical because so many tests are required and because it has never been tried. Each of the imagined obstacles is simply a shortage that can be met, perhaps quite quickly, by (preferably British) manufacturers.

The facilities needed are:

1. A register of names, dates of birth and addresses of all residents registered with a GP, to be updated as necessary with test results, changes of address and addition of unregistered subjects. Anonymous registration with local outlets for sample collection and delivery is needed for those reluctant to give name and address.
2. The equivalent of 14,000 96-well PCR machines running night and day. Enough machines and experienced staff to operate them are already in place in large and small academic and commercial labs throughout the UK, including possible demonstration sites. Posts for three 8-hour shifts might be needed.
3. Self-sample swabs, sample transport tubes individually labelled with name, date of birth and barcoded ID, PCR reagents and microtiter plates for 10 million tests per day. Additional production facilities must be commissioned if necessary.
4. Arrangements to deliver and collect samples from every household once a week, with delivery to a testing lab within a few hours. Results would be entered online by the lab within a day of sample collection. Positive results in those without phone or email would be delivered by courier.

This high throughput would depend on various regulatory emergency waivers:

1. Lab staff would wear PPE where necessary but would not be accredited to conduct medical tests.
2. Laboratories would be advised on precautions but not accredited for handling infectious samples.

3. PCR reagent production with normal non-medical quality control cannot be hampered by patents or regulations on medical test manufacture.

The idea of conducting regular population-wide mass testing, which has never been tried in a large country, is unusual in two respects. First, a voluntary “Dunkirk spirit” collaboration of all university and commercial labs that already have the necessary equipment (a PCR machine) is the only way for 10 million tests to be done daily. Second, manufacture and testing would be arranged in consultation with chemical manufacturers rather than clinical test companies and exempt from regulatory requirements on medical testing. This requires emergency legislation.

Yours sincerely,

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