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# More testing and surveillance needed for COVID-19

Editor: Mark Ragg Author: Lidia Morawska and Guy B Marks on: March 24, 2020 In: Coronavirus outbreak 2019-2020, Global health and climate change, infectious diseases, public health, Public health and population health, tests



Last night (23 March) Australia's deputy chief medical officer, Dr Paul Kelly, said that new protocols determining who can be tested for the virus that causes COVID-19 will be announced in the coming days. Here, Professor Lidia Morawska and Professor Guy B. Marks argue that much more testing is needed, and why.

## Lidia Morawska and Guy B Marks write:

We need to act quickly to prevent a large outbreak of COVID-19. Two international expert research groups have independently published models showing that intensive "suppression" or "control" is required to flatten the curve and avert a large outbreak that would overwhelm health services and be associated with many deaths.

There are two critical measures that are required: extensive testing and human isolation. Here is why and how to do it.

## Testing

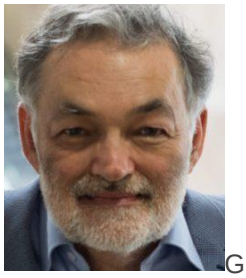
Testifying before Congress on 14 March Dr Anthony Fauci, director of the US National Institute of Allergy and Infectious Diseases, said of testing for COVID-19 that "it is a failing, let's admit it". "Test, test, test" says WHO Director-General, Tedros Adhanom Ghebreyesus. Why is testing for the virus that causes this disease so important?

Usually, when a doctor orders a test it is to decide about treatment: prescribe a medicine, recommend an operation, stop a treatment or advise a change in lifestyle. Generally, tests are only for the benefit of the person who has the test and they directly lead to some therapeutic decision that affects that person. This is *not* the reason to test for COVID-19. There is no effective specific treatment available and the supportive care for pneumonitis caused by this virus is not different for that offered for any other form of pneumonitis.

## Test for the benefit of others

The reason we are encouraged to have a test for COVID-19 is for the benefit of others. Identification of cases leads to isolation of the infected individual and quarantine of their contacts. This prevents the infected individual and their contacts from spreading the disease to others. This strategy seems to have been very effective in controlling transmission of the virus, particularly in South Korea, where the rapid progression of the epidemic has been brought under control, and in Singapore and Taiwan, where it appears to have contributed to preventing an outbreak. In fact, it is not a new approach. Before there was treatment for tuberculosis (TB), there were sanitoria: places in the mountains, away from population centres, where people with TB stayed to convalesce or, sadly in many cases, to die. It seems likely that it was testing for TB and isolation in these sanatoria that led to the gradual decline in deaths due to TB during the first half of the 20th century, before any effective drug therapy was available.


Lidia Morawska


Guy Marks

The problem we face is that, even if we substantially increase the number of test kits available, this will always be a limited resource, and we cannot test everyone. Even if we did test everyone once, we cannot be sure that they will not become infected soon after we test them. We certainly cannot test everyone every day! So, who to test and when? At present we use epidemiological and clinical criteria to inform testing. In Australia, at present, that means we test people who have been in contact with a known case or who have recently arrived from overseas and who also have respiratory symptoms. This is a relatively small number of people and has quite a high yield. However, we do not know how much impact it is having on the epidemic, because we don't know how many cases are being missed.

The problem with this approach is that it is based on limited data and, since others are not being tested, we are not acquiring additional data to correct the existing clinical or epidemiological selection criteria for testing. In fact, a news report suggests that, in one small town in Italy, testing everyone on two occasions did identify several cases without symptoms and, furthermore, it stopped the progression of the epidemic, at least temporarily. Hence, we need better data to decide who to test and when to test them, so that the correct people are subject to isolation, contact tracing and quarantine.

## Test to understand

This brings us to the third reason for testing for COVID-19: to describe and understand the epidemiology of the disease, so as to inform the predictive models that are the basis for public health policy for control of the disease. This surveillance function requires a strategic and purposeful approach to population sampling so that we can build up a complete picture of who is at risk and who is not at risk. The purpose of testing in this context is not to act on individuals, but to inform policy for the population. In fact, the PCR-based test on respiratory secretions that is currently performed to detect active infection may not be required. It may be simpler and just as effective to perform a serological test, which detects antibodies to the virus. This is an indication that the person has been infected and has mounted an immune response to the virus. It is not useful for management of individual patients, but it is useful for building up a picture of the spread of the virus within the population.

### Population surveillance vital

This population surveillance function is vital for controlling the epidemic. It provides the data to calibrate the prediction models that policy-makers are using as the basis for their decisions, that so affect our lives. These decisions include extending or relaxing social controls and refining the criteria used to select target groups for testing, as prelude to isolation, contact tracing and quarantine. It also allows us to predict the future course of the epidemic.

Hence, we do need to “test, test, test”, but we should do so in a targeted and strategic manner that helps to control the epidemic. Failure to do this will mean continuing to fly blind in our battle against COVID-19.

## Isolation

The virus causing COVID-19 spreads from a person to person. It spreads directly, via large droplets, expelled when people are coughing and sneezing. These droplets are big and too heavy to stay suspended in the air, so they normally travel 1–1.5 metres from the mouth or nose of the infected person before falling: on a surface or a nearby person. This means that this is the minimum distance that people should be apart, in order not to make them the target of the falling droplets.

How does this affect meetings or public gatherings? The latest Australian Government advice (20 March 2020) allows meetings of up to 100 people indoors, on condition that there is 4 square meters provided per person within the enclosed space. This would require providing every person in the room with a 2×2 metre space and instructing them to remain in the centre of this square. However, it seems unlikely that the instruction will be interpreted in this way. Rather, people will simply examine the total floor size of the room and the number of people, without consideration for the location of people and the extent of their actual distance from each other. In practice, we believe that, to protect public health, no non-

essential meetings should take place. Essential meetings should include the minimum number of people with people physically separated from each other.

## 1.5 metres not quite enough

Is it sufficient to ensure that people in workplaces and in public transport are at least 1.5 metres away from each other so that large droplets cannot spread from person-to-person? Unfortunately, not completely. This is because the virus can also spread by small droplets that can travel large distances and follow the flow of air induced by the ventilation system. Not all the droplets expired by people are very large, and those that originate from breathing are usually smaller. After expiration, they rapidly evaporate some of their liquid content, and can then be small and light enough to be more affected by air currents than gravity. These very small particles can travel 10s of metres or further. This mode of spread was implicated in the SARS epidemic in 2003 in a hospital (see articles by Li, Xiao and Yu) and during air travel (11). Partly due to this work, the World Health Organization has recognised the importance of airborne transmission of viruses in health care settings.

While it is theoretically possible to predict the direction of the airflow between people in an indoor environment to protect against the viral transmission via small droplets, this is unlikely to be feasible for every room and for every situation of air flow. Even opening a door will change the direction and extent of air flow. The best option is to have people in separate rooms, provided that the ventilation systems are appropriately designed and working properly. Any crack in the filter or improper installation of the filter means that air is going through the gap, and not though the filter. Therefore, to avoid the spread of COVID-19 via small droplets, the number of people in public buildings and public transport should be reduced to a bare minimum.

The cost and disruption of the measures we have proposed, extensive testing and as much human isolation as possible, will be great. However, we fear and expect that the consequences of failure to do so will be greater.

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