We need a COVID DEW Line

Public health experts and politicians are suggesting that we can see a point when restrictions could relax. But any relaxation must be careful and measured, quickly reversible if COVID reappears. Everyone maintains that widescale testing is a key to controlling the reopening of the economy.

Most of the proposed approaches, such advocated by Harvard University see mass testing, detailed contact tracing, and isolation of those testing positive. But is this enough?

In the 1950's as the Cold War intensified, the Canadian and American military staffed about 60 radar stations in the Arctic to detect Soviet bombers. Known as the DEW Line (Distant Early Warning), the intent was to provide timely warning of an impending nuclear attack. With COVID-19 we need a "dew" line to alert us before cases appear in hospital and we must to play catch-up again.

A COVID-19 DEW line has two components: testing widely in the general population, both for the presence of the virus and for the presence of antibodies; and, a strategy for efficiently deploying a testing program across the population. On both fronts, we have some considerable distance to go.

Testing, or more correctly the lack of testing is a signal failure in managing the response to this disease. On that point a consensus exists. However, to be of any value, diagnostic tests for the presence of disease or antibodies against a disease must be accurate

Accuracy in a diagnostic test, medical and otherwise has two components. A *false positive* for Covid-19 is a test result that indicates someone has Covid-19 , when in fact they do not. The result of that error is inconvenience since if the person Is not showing serious symptoms, they will self-quarantine. Far more problematic is the *false negative* which shows that someone does not have Covid-19, yet they do. If symptom free, that individual would be free to go and spread disease.

The problem is that the false negative rate on the Covid-19 test is not known; the suggestion that it could be 3 in 10 is probably wrong. It is likely lower than that and getting better all the time, but unless the error rate is proved to be lower than 5%, the test may not be useful that for mass screening. If someone has the classic symptoms of COVID, yet the test was negative most physicians would override the test result and presume the patient was ill. Further, the turnaround for test results must be rapid – fortunately new tests coming on line show promise.

What about the antibody test? Here the reported errors could also high, but with different consequences. A false negative means the test shows you do not have antibodies when in fact you do. The consequence is that your social life continues to tank. The false positive is clearly more dangerous to the person and society, because someone behaves as if they have immunity when the do not.

Both tests will get better and probably quite quickly. However, another challenge is even the best tests are not ready for wide deployment; manufacturers will require time to produce the hundreds of millions of test kits.

What process should we use for general population testing? We could replicate the random sampling designs used by market researchers, pollsters and official statistics agencies where a small sample supports inference about the population. Logistically we could intercept people much as we test for drunk drivers. Police stop tens of thousands of motorists in a six-week holiday period.

How many people would we need to test and how often? That is where another problem arises. If we assume the current infection rate is 1%, then a random sample of 5000 in a bi-weekly period might reveal 50 with the virus.

The true infection rate is probably much lower simply because we are currently testing only those with symptoms and those in risky occupations. A random sample of 5000 in any province of city could reveal as few as 5 with the virus, far too low to serve as a baseline for guiding public health policy. Increasing the sample size is one approach, but 20 or even 50 thousand intercepts repeated every two weeks, increases logistical complexity and cost.

An alternative course uses a stratified random sample, that targets the intercepted population to optimise estimates of the infection rate. Organizations such as Statistics Canada routinely develop these sampling designs. However, our understanding of Covid-19 must increase before we can confidentially target the sample and estimate how many people we need to intercept in each biweekly period. But it is feasible.

We have a four-month window to create a Covid DEW line before school starts in the fall, major sports begin, and people want to travel for the Fall holiday season, all parts of normal life. Refining process for mass screening, ensuring test accuracy, and accelerating the manufacturing the test kits, to create a COVID DEW line is a very tall order in that short time. But meeting this challenge will define this generation.

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