ARGUMENT

Cheap Mass Testing Is Vital for Pandemic Victory

Switching from expensive, slow PCR tests to self-administered antigen tests could work wonders.

BY ANNIE SPARROW | JANUARY 5, 2021, 10:43 AM

The development of COVID-19 vaccines in less than a year is an extraordinary achievement. But while trials suggest vaccines are highly effective in preventing sickness and death, they are unlikely to make us virus-proof. We don't know yet whether they will prevent spread of the virus—the key to achieving herd immunity. The scale of the project, limited manufacturing capacity, and constraints of intellectual property issues mean it will be months before there is mass deployment of coronavirus vaccines in most countries, let alone protective coverage at

the population level. In the meantime, the pandemic is getting worse.

While a high-tech approach has yielded success for vaccines, it has largely failed elsewhere. Despite billions invested in therapeutics, we lack effective drug treatment—let alone a single reliable cure. And despite the hype, there is no evidence that contact-tracing apps have moved the needle even in countries that kept infection rates very low through other means. In others, such as the UK, they have been an expensive fiasco. Effective testing is central to outbreak control, but PCR

(polymerase chain reaction), the gold standard for testing, has failed in the first task of disease control—identifying and isolating the contagious. The world needs a lower-tech solution: rapid, cheap, and effective testing.

The human cost of the current approach is enormous. The United States is seeing record numbers of hospitalizations and deaths. Across the Europe Union, largely successful in slowing the first wave of COVID-19, many countries have been back in lockdown for at least two months. Even outlier Sweden introduced tighter restrictions. In East Asia, a resurgent winter virus threatens the hard-fought successes in Japan, South Korea, and others.

But it is the emergence of the highly contagious and fast-spreading B117

strain in the UK, and a similar strain from South Africa, that exemplify the catastrophic limitations of our current testing system. Without a tool to easily detect contagious people and meet the demands, border closures, travel restrictions, and lockdowns remain the only options to suppress infection and avert mass life-and-death decisions by already burnt-out medical staff at overstretched hospitals. These measures carry enormous economic and social costs. Shutdowns have destroyed hundreds of millions of jobs, upended education, spread poverty and hunger, and imposed a

terrible toll of isolation, loneliness, and despair.

As we await mass vaccination, widespread testing offers a real alternative to the dismal choice between lockdowns and deaths. Even in a vaccine-led future, COVID-19 inoculation may not be a panacea. While vaccines will be lifesaving for many, especially the elderly, they are approved on the basis of their efficacy in preventing disease and death, not stopping spread. Since the latter is a higher immunological bar, even effective vaccines are likely to be significantly less successful in stopping spread. A strategy to

give one dose to provide some clinical protection may be reasonable—but delaying a second dose may further compromise the ability to stop spread. Reinfections, increasingly reported, may mean that natural immunity has a short shelf life. Testing will remain essential.

And even when shortages are overcome, if the politicization of the virus and use of vaccines as political props leaves people too distrustful to get vaccinated, the goal of herd immunity—estimated at 60 to 70 percent of the population—may remain elusive.

Testing in a pandemic

has several distinct requirements. First, identify the contagious for timely isolation and contact tracing. Second, confirm diagnosis of the clinically ill—particularly important for diseases that are mostly mild and present with non-specific symptoms. Third, test to determine the efficacy of vaccines in reducing spread—particularly important since nearly 50 percent of transmission is silent, and 20 percent of infected people are asymptomatic but may still spread the virus. Since the vaccine is designed to eliminate symptoms, frequent testing is the only way to figure this out. Finally, frequent testing helps to

pick up mutations of the kind that have emerged in the UK.

PCR, the current test, is expensive—$50-$150 per test—and requires laboratories, specialized equipment, and skilled scientists to conduct it, which restricts its capacity to meet increasing demand. These limitations can delay results for up to days.

A newly available testing strategy can rectify the current testing shortfall, provides the means to dramatically curb the number of new infections, and to open up greater use of PCR for sequencing as existing strains mutate and new variants

emerge. Rapid antigen tests are ideal for decentralized testing, especially in communities and cities of moderate to high transmission, where contact tracing is severely limited or simply impossible.

Unlike SARS, which didn't become contagious until symptoms appeared, increased in contagiousness as the disease progressed, and mainly spread in hospitals, COVID-19's spread is largely early and silent—through airborne microdroplets emitted by pre-symptomatic and asymptomatic people. People who develop the disease are contagious

for about two days before symptom onset, with contagion peaking just before symptoms appear, and diminishing over a week. Most transmission happens in the first five days.

To break transmission chains, people infected with COVID-19 must be detected within the critical first few days of becoming contagious. But most people don't seek a test until they feel ill—by which time it is already too late to start self-isolation. If they wait for their PCR test results, it is even later. Because COVID-19 is mostly a mild disease, there is little incentive for many to make the effort and inconvenience

worthwhile. And since several countries restrict PCR testing to symptomatic people, asymptomatic people aren't tested and don't perceive the need to self-isolate. PCR tests, the theoretical gold standard, cannot in practice identify the majority of contagious people in time to stop spread—the single most important task of disease control.

While it seems natural to deploy the most sophisticated technology possible in our fight against the virus, less may turn out to be more. It is time to supplement PCR with rapid antigen tests. Since most spread happens at homes and

places of shared living and so much is silent, testing should be done in the community—by people themselves. These are inexpensive, easy to self-administer, and give results in 15 minutes. This type of test, lateral flow assay (LFA), is widely used for home pregnancy and HIV screening. Used frequently, rapid tests are better than PCR at picking up people who are asymptomatic but contagious

But the real power of rapid antigen tests is exploiting the simplicity and making them available to the public. This combination—people plus rapid tests—provides the means to help stop the outbreak.

If half the population tested themselves twice a week—eminently doable with rapid antigen tests but impossible with PCR—people would find out they their positive status in time to stop unwitting spread to others. Especially if combined with financial incentives, paid sick leave, and social protection for those who are self-isolating, rapid antigen tests could quickly drive down the viral reproductive rate (R) within a few weeks. Once R is below 1, surveillance of waste water is sufficient to check on future outbreaks. Slovakia provided proof of this concept in November, cutting the infection

rate by 60 percent. The Czech Republic began on Dec. 16.

Rapid antigen tests would help to reopen economies quickly, save millions of jobs, and take the pressure off industries that are being crushed by the pandemic such as aviation, tourism, and hospitality. In the United States alone, 11 million jobs depend on restaurants. Globally, the future of live entertainment and sports teeters on the brink. A safe Tokyo Olympics with spectators would no longer be a pipedream. Workplaces and restaurants could reopen, and schools stay open safely. For these

reasons, the International Trade Union Confederation is pressing for urgent, large-scale investment in rapid antigen tests.

In the United States, national rapid-antigen testing would cost less than $10 billion—with a massive return on investment in lives saved, health preserved, needless suffering averted, and huge amounts of money saved.

Some argue that PCR tests are superior because they are more sensitive, and therefore can detect infected people earlier than rapid antigen tests can. This would be true if PCR testing were swift (it is not) and could be

used frequently on large proportions of the population (it cannot). To prevent transmission, carriers and infected must be identified early, when they become contagious. Rapid tests do this well. Slightly lower sensitivity is even an asset because they turn positive only when someone is contagious. PCR's higher sensitivity is a disadvantage because people can test positive long after they cease to be contagious, leading to long or even needless isolation.

Rapid tests are designed to be red-light tests—a positive test tells you that you are unsafe to others, but a negative test is not necessarily a

green light that you are definitely safe: Physical distancing and masking should continue.

They also compensate for the limitations of contact tracing above a certain level of transmission and eliminate expensive contact-tracing apps. Emergency powers become indefensible, intrusive surveillance unjustifiable, and extended lockdowns unnecessary.

Importantly, since uncontrolled spread drives new strains, mass testing with rapid tests would reduce opportunity of the virus to mutate and improve our ability to detect emerging strains quickly. If there isn't

already a U.S. strain hiding in plain sight, it is only a matter of time.

Given the enormous advantages of rapid antigen tests, that they are not in widespread use already is puzzling. The FDA, interestingly, has no way to evaluate a public health test designed to detect contagiousness, and can only evaluate through a medical lens. The misguided debate over sensitivity misses the potential of rapid antigen tests for population-level testing as opposed to individual diagnosis.

Opposition to rapid antigen tests because they are not as sophisticated as PCR tests is like disparaging

the use of masks because they are not as protective as a Hazmat suit. In fact, masks are effective at a population level because everybody can afford to use them frequently. Rapid tests are to PCR what masks are to PPE.

Self-testing using rapid antigen tests would build equity, allow people to be involved in their own health and participate in the health of their community. That agency is more likely to result in a sense of responsibility and successful self-isolation than official coercion and threats. Rapid tests may be the antidote to pandemic fatigue and the distrust of authorities that could

impede vaccine uptake.

But including the public in a whole-of-society approach won't work without the endorsement of governments and global health institutions. Those who stand to benefit most should also demand deployment. Spiritual leaders, sporting giants, tech companies, athletes, actors, journalists, musicians, schoolkids, teachers and parents could all play a part. The sooner we start, the sooner COVID-19 could be brought under control.

Until then, current vaccine shortages and strategies to overcome them increase the risk that new, vaccine-

resistant strains will emerge, particularly in the context of uncontrolled spread. While advances in technology have enabled the rapid development of vaccines, reliance on a high-tech approach alone risks their success. For vaccines to effectively protect us, we may have to fight for their capacity to protect us. Rapid antigen tests can reduce transmission, reduce the risk of new strains developing, and make us all safer. Broadening our strategy beyond today's costly one-dimensional approach will serve us well in future pandemics.

Annie Sparrow is an assistant professor of population health science and policy at Icahn School of Medicine at Mount Sinai in New York. Twitter: @annie_sparrow

TAGS: ARGUMENT, CORONAVIRUS

VIEW COMMENTS