Improving Testing for COVID-19 for the Rural Southwestern American Indian Tribes

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Coronavirus disease 2019 (COVID-19) is caused by the severe acute respiratory syndrome-related coronavirus-2 (SARS–CoV-2) infection. The United States (US) currently has more officially reported cases and deaths from COVID-19 than any other country in the world. The rural Southwestern American Indian (SAI) tribes are disproportionately affected, due to genetics, immunological naivety, social determinants of health, and high prevalence of concomitant comorbidities and co-exposures (1). On March 30, 2020, the New Mexico Governor, Michelle Lujan Grisham, informed the US President Donald Trump of the "incredible spikes" in cases of COVID-19 within the Navajo Nation in the rural Four Corners region of the American Southwest (2). The Governor warned that the disease "... could wipe out those tribal nations."

Use of COVID-19 testing as an approach to combating the pandemic is supported by an Iceland-based epidemiological study, and endorsed by the World Health Organization (3). Rural states in the US rank higher in prevalence of COVID-19 risk factors (hypertension, obesity, and diabetes), but rank lower in overall testing rates (4). Notably, several Southwestern states such as Arizona, Texas and Oklahoma have among the lowest testing rates in the country (5). Taken together, these results suggest that the current COVID-19 surveillance does not effectively capture medically vulnerable rural populations in the Southwest (4). Testing in the SAI tribal communities is further limited by the following reasons: 1) misinformation on tests due to the lack of broadband Internet access; 2) inadequate access to test sites due to lack of transportation and long travel distances; 3) traditional mistrust of the healthcare system; 4) concern about mishandling of biological samples; 5) misunderstanding that molecular assays interpret the genetic structure of the virus and not their people; 6) difficulty paying for the tests; and 7) nationwide shortage of test kits. Buy-in from community leaders and traditional healers, utilizing culturally sensitive communications, and access to broadband Internet are crucial to improving effective testing-based surveillance in these communities.

A large number of molecular and serological tests for COVID-19 are currently available, many of which lack evaluation data. Molecular tests, useful for establishing a diagnosis, utilize respiratory tract specimens to assess for the presence of nucleic acid targets specific to SARS–CoV-2 using the reverse transcriptase-polymerase chain reaction (RT-PCR) or nucleic acid amplification assays. RT-PCR–based assays performed in the laboratory on nasopharyngeal swabs collected by trained professionals are currently the cornerstone of COVID-19 diagnostic testing. Most RT-PCR assays take a few hours to complete, but the Cepheid assay has shortened the test duration to 45 minutes (6). Recent molecular tests such as CRISPR-Case12-based lateral flow assay and Abbott ID Now™, utilizing isothermal nucleic acid amplification technology for the qualitative detection of viral RNA have shortened the turnaround time further (7). Unlike molecular tests, serological tests may be useful in public health surveillance and vaccine evaluation, but not as the sole test for diagnosing the acute stage of the disease (8). Performed on blood specimens, serological tests use formats such as enzyme-linked immunosorbent assay and rapid lateral flow immunoassay, to detect immunoglobulin M (IgM) and/or immunoglobulin G (IgG) antibodies, which are produced by the body at approximately 10 days and 20 days respectively following COVID-19 infection. Current molecular and serological tests are laboratory-based and not easily available in the SAI tribal settings.

Living far away from hospitals, rural SAI residents need easy access to sample collection venues. Across the world, many different sample collection venues can serve as useful prototypes, which includes drive-through-, booth-, mobile laboratory-, and home-based approaches. The latter approach involves the use of self-test kits, which are ideal. The approach involves kits containing instructions for testees to self-collect nasal swabs (or possibly early morning salivary specimens (9)) for molecular tests, or finger-stick blood samples for serologic tests. The FDA recently granted emergency clearance to the first at-home molecular test, a nasal self-swab kit (Pixel, LabCorp, USA), with a mail-back to the company laboratory for conducting the PCR assay, with online access to the results (10).

Although not currently available, the ideal test for the SAI tribal settings is low cost, less complex, point of care, rapid (i.e., test turn-around time preferably within an hour), and able to be performed by non-laboratory professionals in low-infrastructure settings, such as homes. The test results could be potentially uploaded to a mobile app or be viewed over a telemedicine consultation to interpret the results and provide immediate counseling on the next step. Smartphone-based devices containing a cartridge-housed microfluidic chip, which carries out isothermal amplification of viral nucleic acids from nasal swab samples in 30 minutes, which are detected using the smartphone camera, may soon be available for home testing (11). Rapid point of care serologic tests, similar to finger-stick blood glucose tests, and home pregnancy tests with colorimetric reading, mal also soon become available for home testing (12).To take advantage of rapid point-of-care testing that will soon become available, improving access to smartphones and broadband Internet in SAI tribal communities is crucial.

The primary goal of the pandemic containment in the rural SAI tribal communities is to reduce the basic reproductive number (R0, the expected number of cases directly generated by one case) of the SARS–CoV-2 virus, thereby reducing disease transmission. Given the lack of effective vaccines or treatments, the only currently available levers to reduce SARS–CoV-2 transmission are to practice social isolation, universal masking, and hand hygiene, identify asymptomatic and symptomatic infected cases through ideal testing strategies, and isolate contagious persons (8). Although not currently available, the ideal test for SAI communities is point of care, rapid, and home-based and requires efforts to improve access to smartphones and broadband Internet. Testing can be popularized using community leaders and traditional indigenous care providers. Finally, policy solutions are needed to eliminate financial barriers for uninsured or underinsured patients, to help meet the goal of improving testing-based COVID-19 surveillance in the rural SAI tribal communities.

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