From Easing Lockdowns to Scaling-Up Community-Based COVID-19 Screening, Testing, and Contact Tracing in Africa – Shared Approaches, Innovations, and Challenges to Minimize Morbidity and Mortality

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Summary:

This crisis presents a unique opportunity to align COVID-19 services with those already in place for HIV, TB, Malaria, and other non-communicable diseases (NCDs) through mobilization of Africa's inter-professional healthcare workforce to contain the pandemic

Abstract

The arrival of COVID-19 to the African continent resulted in a range of locally relevant lockdown measures, which curtailed the spread of SARS-CoV-2 but caused economic hardship for large sections of the population. African countries now face difficult choices regarding easing of lockdowns and sustaining effective public health control measures and surveillance. Control of the COVID-19 pandemic will require efficient community screening, testing, contact tracing, and behavioral change interventions, adequate resources, and a well-supported, community-based team of trained, protected personnel. We discuss COVID-19 screening-testing-contact tracing approaches used in selected African countries and the need for shared, affordable, innovative methods to overcome challenges and minimize mortality rates. This crisis presents a unique opportunity to align COVID-19 services with those already in place for HIV, TB, Malaria, and other non-communicable diseases (NCDs) through mobilization of Africa's inter-professional healthcare workforce to contain the pandemic. By addressing the challenges, the detrimental effect of the COVID-19 pandemic on African citizens can be minimized.

Keywords: COVID-19, SARS-Cov-2, Screening Testing, Contact Trace, Africa

Introduction

As of May 26th, 2020, the World Health Organization Africa Region (WHO-AFRO) has reported 80,979 COVID-19 cases with 2,193 deaths from 45 countries, with South Africa having the highest confirmed number of cases (23,615) [1]. Whilst these numbers are smaller than in the United States or Europe, the WHO estimates that up to 190,000 people could die in Africa from COVID-19 if not brought under control [2]. African countries face the difficult task of striking a delicate balance between institution of effective measures to curtail the spread of SARS-CoV-2 and minimization of economic hardship for large sections of the population by easing lockdown measures [3]. We discuss COVID-19 screening-testing-contact tracing experiences from selected African countries and the need for shared, affordable approaches and innovations to overcome challenges and minimize mortality rates.

Africa's dilemma

Scalable labor- and cost-efficient door-to-door contact tracing calls for increased manpower and national funding. Extensive human resource mobilization will be necessary to respond effectively [4]. Worryingly, only 15 African countries currently have health infrastructures that include a functioning national public health institute. COVID-19 surveillance post lockdown will require operations centers for proactive digitalized surveillance linked with capacity for rapid diagnostics and highly trained response teams. Nonetheless, these investment costs will need to be weighed against the economic costs of inadequate action; analysis shows that COVID-19 will cost the region between $37 and $79 billion in output losses in 2020 [5]. Waiting for assistance from donor countries is frowned upon by the Africa CDC [4] since aid was slow to arrive at the beginning of the pandemic. African countries can develop and sustain effective, local COVID-19 control programs.

Community COVID-19 Screening Experiences

In South Africa, approximately 28,000 Community Healthcare Workers (CHCWs) have been deployed. By the end of April 2020, over six million people were screened and 42,000 referred for testing. **Figure 1** shows COVID-19 screening activity by sub-district in Cape Town, the epicenter the pandemic in South Africa. A total of 16% of those screened were referred for testing at health facilities (range 4% - 48% by subdistrict). **Table 1** describes the implementation challenges and possible solutions.

While the Democratic Republic of the Congo (DRC) is confronting the COVID-19 crisis, its eastern northern province Kivu faces the last phase of its 10th Ebola virus disease (EBV) outbreak response in the last 40 years. The first confirmed COVID-19 case in DRC was reported on March 10th, 2020 in the capital city Kinshasa, and cases totaled 2,304 and 66 deaths as of May 26th [4]. **Figure 2** shows that as the proportion of imported cases decreases, there is steady increase of community transmission and confirmed positive contacts in Kinshasa, the epicenter of the epidemic in DRC. EBV infrastructure and human power experience in case finding are now being applied for the COVID-19 response. Also, the DRC government's COVID-19 task response structure was incorporated into existing health structures tackling HIV, TB, malaria, and Non-Communicable Diseases (NCDs). ICAP at Columbia University's Resilient and Responsive Health Systems (RRHS) project in DRC, supported by the U.S. Health Resources and Services Administration (HRSA), is implementing a multi-professional health team of nurses, midwives, doctors, pharmacists, medical students and CHCWs in COVID-19 sensitization, screening and testing referral activities endorsed by the ministry of health, community, and faith leaders.

The United Republic of Tanzania with 480 confirmed COVID-19 cases and 21 deaths as of May 26th, 2020 [1], introduced "Health Commandos," CHCWs specific for the COVID-19 response, for every street in the country beginning with the worst hit city of Dar-es-Salaam.

Trained and wearing special gear, they walked the streets educating the community on social distancing, hygiene measures, screening, and referrals for COVID-19 testing. In Rwanda, proactive screening, testing, isolation of confirmed first COVID-19 cases, and contact tracing led to travel bans and country lockdown, which helped flatten the curve and contain the epidemic with only 336 confirmed cases and no deaths as of May 26, 2020. Of note, screening is done mainly by doctors and other CHCWs. An innovative role for final-year medical students trained in sample collection, transportation, and analysis under the National Reference Laboratory allowed testing of 30,000 people as of April 30th, 2020: 243 were COVID-19 positive. Fortunately, most of the cases were young and asymptomatic, and 104 recovered.

In Mozambique, by end-May, there were more than 700,000 individuals screened, 15,090 quarantined, and more than 8,796 individuals tested, from which 209 were positive for COVID-19. Unfortunately, displaced, and migrant populations (e.g., North and Central Mozambique) have not been reached for screening or implementation of mitigating measures due to political instability or terrorism.

SARS-CoV-2 Testing: Logistics and Challenges

Globally, the current gold standard test for SARS-CoV-2 infection is detection of viral RNA in a sample from the respiratory tract by RT-PCR [6-8]. Specialized laboratory facilities with skilled staff and expensive equipment to undertake these tests are scarce in most African countries. Centralized laboratories with testing facilities require samples to be transported, and thus turnaround times may be suboptimal, resulting in loss to follow-up. Point-of-care (PoC) or near-patient solutions are preferable [9, 10]. The GeneXpert platform, already in place for TB testing across Africa, allows the use of SARS-CoV-2 cartridges, but drawbacks include cost and supply constraints. PoC viral antigen detection is not yet sufficiently sensitive [11]. The use of patient self-collected nasal swabs or saliva samples would be

easier and safer than nasopharyngeal swabbing by healthcare staff. Serological testing for antiviral antibodies is now available [12] but only indicates recent or past infection and is unsuitable for diagnosing active COVID-19 cases. Importantly, seropositivity does not indicate immunity to SARS-CoV-2 [13]. However, antibody testing can allow reconstruction of transmission chains during outbreaks and community prevalence surveillance.

Whilst the Africa CDC is facilitating regional collaborations and procurement and distribution of diagnostic tests across Africa, important operational and resource issues need to be addressed to avoid stockouts, supply-chain challenges, and competition among countries [4]. Incorporation of private and non-governmental sector laboratories in the rollout of testing and the use of existing available PoC diagnostic platforms for other diseases (e.g. TB, HIV) are promising strategies to improve availability and turnaround times and reduce reliance on central laboratories (**Table 1**). Ideally, diagnostic tests and reagents should be produced within Africa. Also, PoC COVID-19 testing at pharmacies may improve access to care and effective use of available healthcare workforce.

Contact Tracing

Case finding and contact tracing depend on substantial COVID-19 testing capability, sample throughput, and rapid turnaround times [14, 15]. In the Western Cape Province of South Africa, public and private laboratory results of confirmed COVID-19 cases are communicated electronically and assigned to provincially-based telephonic teams who then contact cases and their contacts. Where this is not feasible, the persons concerned are relocated to designated isolation facilities. Cases and contacts are then monitored for 14 days. Workplace and airline contacts are also pursued. Legislation is available for mandatory isolation, should any person be unwilling to undergo the necessary self-isolation.

In Rwanda, once a COVID-19 case is suspected, a sample is collected at a satellite site and sent to the National Reference Laboratory for testing, and the result is available within 10 hours. If positive, the index case is isolated. Contact tracing entails the following steps: (1) case investigation procedure to identify all clinical symptoms; (2) memory history to recall all possible contacts during the window period, 2 to 14 days before the onset of the symptoms, who were within one meter of the index case; and (3) a roster of close contacts of the index case within the window period (for subsequent screening). As of April 30th, 2020, 3,657 individuals linked to COVID-19 cases were traced by command posts across the country.

In DRC and Tanzania, contact tracing is conducted by CHCWs using mobile phone calls and SMS and home visits if necessary. In selected provinces of DRC, a multi-professional health team described earlier is being implemented for contact tracing by RRHS project. In Mozambique, contact tracing is done by the staff of the National Institute of Health, medical residents, and students from the Master Program on Field Epidemiology and Laboratory Training Program (FELTP) supported by CDC [16]. These cadres are trained and skilled in applying a screening epidemiological case identification tool and on procedures for contact tracing and surveillance of quarantined individuals and home-isolated COVID-19 cases. This strategy has proven effective thus far because of the limited number of cases and contacts to trace at a specific moment in time.

Conclusions and Way Forward

Resource-constrained African governments face difficult choices regarding surveillance and easing of lockdown. Control of the COVID-19 pandemic will be possible only with efficient community screening, testing, and contact tracing and behavioral change interventions, which require adequate resources and a well-supported, community-based team of trained, protected personnel. Every part of this public health chain needs to be strengthened. With an already understaffed health force, Africa cannot afford the 10% infection rate of healthcare workers seen in selected European countries. This crisis presents a unique opportunity to align COVID-19 services with those in already place for HIV, TB, Malaria, and NCDs through mobilization of Africa's inter-professional healthcare workforce to contain the pandemic. By addressing the challenges, the detrimental effect of the COVID-19 pandemic on African citizens can be minimized.

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Figure Legends:

Figure 1. COVID-19 Community Screening by sub-district in Cape Town, South Africa, April 4th to May 22nd, 2020, Cape Town, South Africa

Figure 2. COVID-19 daily case numbers in Kinshasa, Democratic Republic of the Congo (March 15-April 02)

	Table 1. Challenges and possible Solutions for Scaling-Up COVID-19 Community-Based Screening, Testing and Contact Tracing Experiences from Select African Countries		
	Target Country by Burden	**Early and late Challenges**	**Priority Solutions**
1	South Africa	• Fake news adding to anxiety, rejection, and non-cooperation • Staff anxiety about the risk of SARS-CoV2 infection • Rejection and racism experienced by some CHCWs due to clashing cultures, language barriers • Stigmatization of the workers by the communities based on their wearing of PPE • Some communities' outright rejection of screening • Long turn-around time of PCR results • Small spaces within the houses visited, overcrowding in some houses • Elderly and disabled cannot reach screening/testing sites • Hard to reach populations: homeless, sex workers, children, essential workers, prisoners • Instability of mobile device apps for collecting household data • Difficulty in obtaining GPS data of home visits • Parallel data collection system requirements for the Department of Health and external funders	➢ Ongoing communication to communities, in local languages using multiple platforms and players to immediately address inaccuracies circulating on social media by using authoritative voices- daily myth busters ➢ Active and regular use of symptom self-screening tools by staff & communities ➢ Active daily monitoring of symptoms with feedback from management ➢ Temperature monitoring of staff and people screened makes for greater reassurance ➢ Ease access to testing for staff by having testing centers at workplaces ➢ PoC COVID-19 testing at pharmacies ➢ Support staff during their quarantine while waiting for results- especially with management of their households/families/children ➢ Improve the turnaround time for staff SARS-CoV2 PCR testing outcomes ➢ Referral service whereby communities and their household members can access telephonic assistance and counselling and face-to-face emotional support, if required
2	Democratic Republic of the Congo	• Some community members do not believe that disease exists • Poverty levels limit respect for the application of barrier measures • Screening is centralized at the national level, which causes a delay in delivery of results to provinces • Contact tracing is done only by a small team in provinces due to shortage	➢ Scale-up community COVID-19 sensitisation and barrier measures in public places ➢ Leverage infrastructure, human resources, & training platform of Ebola Viral Disease for COVID-19 ➢ Decentralization of screening and PCR testing using PoC machines in provinces ➢ Increase contributions of government funding and international partners for COVID-19 response

		of PPEs • Shortage of GeneXpert machines • Shortage of reagents/cartridges with increased demand for suspected COVID-19 cases	
3	Tanzania	• Shortage of PPE • Laboratory testing insufficiencies • Shortage of adequately trained CHCWs	➢ Build local capacity to produce PPE ➢ Refurbish the National reference laboratory ➢ Scale-up trained multi-professional CHCWs for COVID-19 screening. Testing and contact tracing
4	Rwanda	• Limited laboratory capacity to run 1500 or more tests per day • Long turnaround time of PCR results, especially for people quarantined in peripheral sites • Difficult to track movement of truck drivers using modern devices and GPS	➢ Pooled testing approach for COVID-19 mass testing ➢ Test GeneXpert platform for COVID19 for phases 2-3 of lockdown ➢ Establishment of COVID-19 testing capacity using existing platforms at decentralized level ➢ Use of tracking devices embedded with GPS for trucks drivers
5	Mozambique	• Limited financial resources to purchase diagnostic kits and other related supplies • Limited laboratory infrastructure to process samples • Limited number of laboratory technicians to process samples • Scarcity PPE for health workforce within National Health Service • Fear and anxiety among health workforce for the risk of SARS-CoV2 infection • Myths and misconceptions about cause of COVID-19 • Poverty and lack of formal employment, which makes it difficult to keep affected people in confinement • Hard to reach populations: people living in areas of armed conflicts	➢ Fund mobilization trough external Government entities, academia philanthropic institutions, and civilian community ➢ Optimize and share existing GeneXpert platform for TB testing and other PCR equipment from other research laboratories ➢ Refresh and train existing laboratory technicians working in molecular diagnosis throughout the country ➢ Providing PPEs and refreshment trainings on biosafety measures and ensuring social support in case health workforce get infected ➢ Strong advocacy and use of all mean of communication to increase awareness of disease within the population ➢ Distribution by the Government and partners of basic food baskets and other necessities ➢ Strengthening of Epidemiological Surveillance, identification of cases and contact tracing, and monitoring of individuals in quarantine and isolation ➢ Strengthening of hospitalization conditions for covid-19 patients with moderate to severe diseases and hospital infection prevention interventions

RT-PCR: Reverse Transcriptase Polymerase Chain Reaction; CHCWs: Community Healthcare Workers; COVID-19: Coronavirus Diseases 2019; SARS-coV2: Severe Acute Respiratory Syndrome Coronavirus 2; DRC: Democratic Republic of the Congo; POC: Point-of-Care; PPE: Personal Protection Equipment.

Figure 1

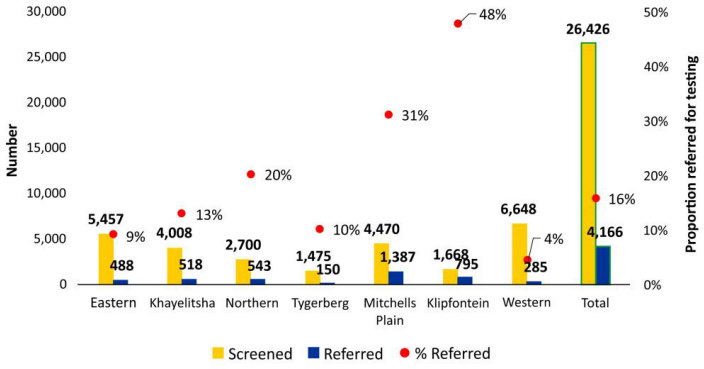

Figure 2