African Union

AFRICA CDC

AFRICA CENTRES FOR DISEASE CONTROL AND PREVENTION

Enhanced COVID-19 Surveillance at the Community Level in Africa

Table of Contents

Background

By September of 2021, over a year and a half after the start of the coronavirus disease 2019 (COVID-19) pandemic in Africa, over 75% of African Union (AU) Member States had experienced a third wave of the pandemic.

With inadequate vaccination coverage and more virulent variants circulating[1], it is expected that additional waves will continue to affect Member States. A longer-term surveillance strategy is needed to help Member States contain the pandemic and prevent future waves. Breaking transmission cycles relies on identifying undetected cases early and implementing appropriate public health and social measures (PHSM).

In alignment with the Adapted Africa Joint Continental Strategy for COVID-19 Pandemic, Africa CDC has developed this enhanced COVID-19 community-level surveillance strategy and guidance document to aid Member States to:

- rapidly detect and isolate cases;
- identify sub-national hotspots and population sub-strata where interventions like PHSM and vaccine rollout can be targeted;
- reduce the overall spread of COVID-19 and its impact on healthcare systems.

Objective of Surveillance Strategy

The objective of this surveillance strategy is to rapidly detect resurgences of SARS-CoV-2 during phases of low to moderate incidence, as an early warning to inform and enable timely implementation of PHSM to limit transmission of the virus and to guide effective response to mitigate harm to communities.

1 Fisman D, Tuite A. Progressive Increase in Virulence of Novel SARS-CoV-2 Variants in Ontario, Canada, February to June, 2021. medRxiv. 2021 Jan 1.

Recommendations for Enhanced Public Health Surveillance of COVID-19

To achieve this objective, AU Member States should enhance, where feasible, existing COVID-19 surveillance to include: **1) community-based surveillance** to detect symptomatic cases early for treatment and to avert viral transmission; **2) sentinel surveillance** to detect both presymptomatic and asymptomatic cases, and track virus trends in high-risk populations; and **3) wastewater surveillance** to monitor early environmental signs of virus transmission and identify communities where targeted interventions can be implemented to decrease transmission. Recommendations for how Member States can establish enhanced COVID-19 surveillance, or reinforce existing national surveillance systems, are outlined in the following sections. **All public health surveillance implementation recommendations are linked to the epidemic phases** as defined in the Africa CDC Step-wise Guidance as well as the public health and social measure tiers (see Appendix 1).

Community-based Surveillance

Africa CDC recommends that AU Member States enhance the sensitivity of their existing event- and indicator-based surveillance systems through the inclusion and rollout of community-based surveillance (CBS)[2]. CBS is a critical component of event-based surveillance and is useful for the early detection of individual cases and clusters of COVID-19 in communities. Key to achieving this is the development of sensitive signals[3] and the training of community health workers, opinion leaders, traditional leaders and other stakeholders in the detection and reporting of public health threats at community level. Community surveillance should particularly be enhanced in closed settings (schools, places of worship, clubs), camps (refugee, internally displaced, military, etc.) and within other settings hosting vulnerable populations (e.g. long-term care residences).

2 Community-based surveillance: is the systematic detection and reporting of events of public health significance within a community, by community members. Community health volunteers, the public, religious leaders, civil society members, teachers, and similar groups are engaged and trained to detect and immediately report unusual health events or health risks occurring in their communities. This contrasts with surveillance efforts that only rely on receiving information from health systems reporting.
3 Signal: Data and/or information representing potential acute risk to human health, such as an outbreak. Signals recognize patterns, such as clusters of illness, animal deaths, and ill persons with symptoms not usually seen in communities. (See Africa CDC Event-based Surveillance Framework)

Considering the more sensitive nature of signals, it is recommended that Member States adopt a signal definition as opposed to suspected case definition[4] at the community level. Once a signal is verified and validated as an event, all community members who meet the signal definition should be tested within 24 hours of detection. Existing community capacity, such as community health workers (CHW), should be leveraged to test individuals at the community level. Increased efforts should be made for CHWs to be trained on rapid antigen testing, including sample collection and handling. CHWs should be supervised on a regular basis to ensure testing and reporting is done in accordance with best practices and approved procedures. This then informs public health interventions for case management, quarantine of contacts and outbreak investigation. Reporting should be integrated into the existing surveillance system to ensure long term sustainability and data mainstreaming. A reporting tool (preferably electronic or hotline) should be made available to support real-time reporting to the next administrative level of the healthcare system. CBS systems like this can be further enhanced to promote vaccine uptake, follow up for vaccine second dosages, and strengthen pharmacovigilance for adverse events following immunization in areas with mass vaccine roll-out.

CBS should be integrated as much as possible with the national and regional Health Management Information System (HMIS) and should be implemented in partnership with local authorities and sub-national governance coordination structures, directly engaging local associations (for example youth clubs, women clubs, older people associations, etc.) to facilitate penetration into the target communities.

CBS Objective

Phases 0-4: Test (with rapid antigen tests) **all community members that meet the COVID-19 signal definition** of exhibiting COVID-19 symptoms of fever, cough or difficulty in breathing

CBS Targets

Target: Test 90% of individuals identified in the community that meet the COVID-19 signal definition each week

Monitoring Indicators

Number of individuals identified from the community that meet the signal definition each week

- % of individuals identified from the community that meet the signal definition that are tested each week
- % tested that are SARS-CoV-2 positive
- % of close contacts of SARS-CoV-2 positive individuals that are tested
- % tested positive who received care according to national guidelines

4 Signal definitions are predefined, measurable events that can be observed in a community. They are individually designed to recognize a pattern of disease that would correspond to the specific disease agent or entity that one wants to identify and track.

Sentinel Surveillance

Sentinel surveillance of high-risk populations can facilitate faster detection of SARS-CoV-2 rebound and monitoring of disease trends. Sentinel surveillance can help detect clusters of infections early on, especially in asymptomatic or pre-symptomatic individuals that would not normally be identified through CBS methods. The key populations at risk are those working indoors, in crowded settings, and in close contact with members of the community that could be infected or transmitting SARS-CoV-2 such as **healthcare workers** (HCWs) and **teachers**.

Organised routine testing with these subsets of the community has been shown to enable timely identification of cases and prevent further spread of SARS-COV-2 infections in the greater population albeit with some limitations to be considered[5,6].

During Phase 0-3 (periods of low to moderate incidence), when it is important to rapidly identify and isolate COVID-19 positive individuals who have contact with many persons in the community to decrease further spread, Africa CDC recommends that AU Member States conduct sentinel surveillance in high-risk populations like HCWs and teachers. All individuals within the target high-risk population, **regardless of vaccination status or the presence or absence of symptoms[7],** should be sampled at least monthly. The sentinel surveillance sampling should be implemented on a rolling basis, with testing and analysis of results being conducted weekly (e.g. an individual HCW would be tested once a month, but a hospital may be conducting testing of staff in cohorts every week) to identify transmission trends in that population and to inform response efforts. Those found positive should be isolated and contact tracing conducted and linked to the community-based surveillance system and/or integrated disease surveillance and response (IDSR) system.

As community transmission increases, the chance of infections in these persons also increases; therefore, testing more frequently (e.g. every two weeks in alignment with the incubation period of COVID-19) may be beneficial if country capacity can sustain this along with on-going and increased pandemic response demands. Frequency should only be increased if testing capacity is adequate, as often during disease surges test supplies run low, and priority should be given to contact tracing and identifying symptomatic individuals. Additional high-risk populations may be included as determined appropriate by Member State capacity and interest.

5 Sexton ME, Kraft CS. 2021. Routine Antigen Testing Is Not a Substitute for Health Care Worker Vaccination against SARS-CoV-2. J Clin Microbiol 59:e01564-21. https://doi.org/10.1128/JCM.01564-21.
6 Kanji JN, et al. 2021. Multicenter Postimplementation Assessment of the Positive Predictive Value of SARS-CoV-2 Antigen-Based Point-of-Care Tests Used for Screening of Asymptomatic Continuing Care Staff. J Clin Microbiol V59, No.11. https://doi.org/10.1128/JCM.01411-21
7 Sentinel surveillance can also help identify individuals, previously vaccinated, that may be experiencing breakthrough infections due to waning immunity or circulating variants. These regular samples also allow monitoring for new variants and inform the need for future vaccination. If a breakthrough infection has occurred, it is recommended that these samples be prioritized for genomic analysis.

Sentinel Surveillance Objective Phase 0-3:

- Test (rapid antigen tests) **all high-risk individuals** (e.g. HCWs and teachers) included in sentinel surveillance **each month**

Sentinel Surveillance Targets Target:

90% of identified high-risk individuals tested monthly, specifically at least:

- Test 90% of teachers on the continent each month
- Test 90% of healthcare workers on the continent each month

Monitoring Indicators

- % of sentinel population tested/ month
- % tested that are SARS-Cov-2 positive

Wastewater Surveillance

To aid in the early identification of subnational 'hotspots' where transmission of SARS-CoV-2 may be going undetected in the community, AU Member States, where feasible, should consider implementing SARS-CoV-2 wastewater surveillance. Wastewater surveillance, or the detection of SARS-CoV-2 RNA in wastewater drainage points, is a non-invasive way to test for virus circulation in populations.

Levels of SARS-CoV-2 RNA in wastewater have been correlated with COVID-19 cases in the community, and this surveillance, if done routinely (at least once every two weeks), can augment monitoring and identify newly developing hotspots.

While surveillance, testing and reporting should be prioritized, Member States may wish to focus wastewater surveillance on districts with low reporting where poor surveillance and testing is suspected to be the reason for low/no incidence. Additionally, repeated negative sampling of wastewater can be used to validate surveillance reports of low, or no, cases in a catchment area.

The location of testing can be modified over time to try to pinpoint outbreaks in specific communities. For instance, if wastewater sample collection is done at a point upstream from the treatment plant, at sewage drainage points that collect from specific buildings or locations (e.g. a university[8], government building, or high-risk community), it would be possible to narrow detection from those locations to guide targeted interventions and further testing. Use of upstream sampling methods (e.g. testing a targeted building or area) should be based on testing capacity and feasibility of sample collection at the drainage of points of interest. Some drainage systems mix from many sources, and

8 https://journals.asm.org/doi/epub/10.1128/mSystems.00793-21

there may not be a way to pinpoint particular drainage locations practically. Lack of sewer networks in some of the priority areas may also limit the opportunity for environmental surveillance.

Testing wastewater is complex and if done improperly, will be inaccurate and misleading. Therefore, including experts on environmental microbiology and wastewater systems is critical to determining the feasibility and methodology of carrying out this form of surveillance. Many countries have previously used wastewater testing for polio surveillance[9] and this institutional knowledge can be built upon to inform COVID-19 wastewater surveillance implementation.

The type and frequency of wastewater testing will be dictated by the capacity and infrastructure of each Member State. Where implemented, it is recommended that in communities where no transmission is reported, wastewater surveillance sampling is conducted at least every two weeks to identify the presence of the virus as early as possible. To augment public health data regarding trends in disease burden, the testing should be performed at least once every two weeks.

Wastewater Surveillance Objective

Phases 0 to 4: Collect and test wastewater samples at least once every two weeks from the same sites to detect presence of virus in wastewater and to monitor trends of viral circulation used to inform public health and social measure interventions

Wastewater Surveillance Targets

Target:

- 90% of identified sites collect and test wastewater samples at least every two weeks
- ≥ 80% of communities or hot spots identified by wastewater surveillance results are linked to public health action (e.g. increased CBS in identified communities, targeted PHSM implementation, etc.)

Monitoring Indicators

- ≥ 80% of scheduled samples are collected on the date and time assigned
- ≥ 80% of samples must arrive in laboratory within 3 days after collection
- ≥ 80% of results are returned within 5 days of specimen receipt in the laboratory
- % of samples tested that are SARS-Cov-2 positive

9 Global Polio Eradication Initiative

Testing and Reporting Considerations

To ensure successful implementation of the suggested surveillance strategies the following testing and reporting considerations should be addressed.

Recommended assays

COVID-19 assays with rapid turnaround time (TAT) such as **antigen rapid diagnostic tests (Ag-RDTs)** are the preferred testing method **for community-based and sentinel surveillance** in high-risk groups, irrespective of symptoms, as an early marker of virus transmission. Ag-RDT's lower costs as well as logistical considerations such as their ease of use, TAT of 15-30 minutes, and availability at point-of-care (POC) outweigh analytical test performance limitations. Africa CDC has developed a Monitoring and Evaluation framework of COVID-19 Ag RDT in Africa, which includes selected indicators and reporting requirements to track the progress of Ag-RDT testing roll out in Member States.

Ag-RDTs that have been assessed through a national emergency use authorization and/or WHO emergency use listing (EUL) procedure should be prioritized for use. Currently, four Ag-RDTs have been approved by WHO for emergency use[10]. However, as additional technologies achieve sensitivity ≥80% and specificity ≥97% compared to the Nucleic Acid Amplification Test (NAAT), new Ag-RDTs will be accepted on the WHO EUL. To optimize the performance, Ag-RDT testing should be performed by trained personnel (healthcare workers, community healthcare workers, or laboratory staff) in strict accordance with the manufacturer's instruction for use (IFU)[11]. For more information on quality assurance of rapid Ag tests for COVID-19 diagnosis, please review the SARS-CoV-2 Antigen Rapid Testing for Diagnosis of COVID-19 - Quality Assurance Framework.

The molecular test method, which will be used for the analysis of wastewater samples, should be able to detect the signatures of SARS-CoV-2 and quantify their concentration in wastewater[12]. Therefore, for wastewater surveillance, real-time quantitative polymerase chain reaction (RT-qPCR) can be applied to screen for SARS-CoV-2 specific genes in wastewater. In general, the wastewater sample should undergo efficient treatment to obtain a concentrated sample, with subsequent extraction of SARS-CoV-2 RNA and quantification of the RNA[13]. Optimization and standardization of sample processing and analytical procedures should be conducted by the testing laboratories, therefore analysis of wastewater samples for detection and quantification of SARS-CoV-2 RNA should preferably be carried out by properly trained personnel in suitably equipped laboratories.

10 WHO Emergency Use Listing for In vitro diagnostics (IVDs) Detecting SARS CoV 2
11 Antigen-detection in the diagnosis of SARS-CoV-2 infection using rapid immunoassays
12 Karthikeyan, Smruthi et al. "Rapid, Large-Scale Wastewater Surveillance and Automated Reporting System Enable Early Detection of Nearly 85% of COVID-19 Cases on a University Campus." mSystems vol. 6,4 (2021): e0079321. doi:10.1128/mSystems.00793-21
13 Wastewater Surveillance Testing Methods | Water-related Topics | Healthy Water

Location of testing sites

The SARS-CoV-2 Ag-RDT can be performed at the point of care (POC), without the use of a biosafety cabinet (BSC). It is important to ensure that test operators follow appropriate biosafety practices and procedures[14]. Appropriate personal protective equipment (PPE), in accordance with national guidelines, should be used when collecting samples and performing the rapid Ag test. For community and sentinel surveillance, the rapid Ag test will be performed in community settings (workplaces, schools, etc.) and/or health facilities. It is recommended that different options are evaluated based on country context, for example in rural settings or informal settlements, mobile testing units may be a good consideration. Additionally, it might be beneficial to co-locate vaccination efforts where tests are administered. In all cases, the sample collection and testing areas should meet the biosafety requirements for rapid Ag testing.

Reporting of results

Timely reporting of test results should include: the number of persons tested with Ag-RDT (test statistics), the number of positives, and the number of negatives. This will not include known positive patients tested for follow-up purposes. If a test other than Ag-RDT is used, this should be noted. A national data management center (NDMC), responsible for testing data collection and curation, needs to be formally designated as part of epidemic response entities and lines of reporting should be well established. **The use of a national unique identifier is preferable** to allow linkages with other databases (e.g. case management, vaccination, etc.). The data manager or focal point responsible for SARS-CoV-2 testing sites should report testing data to the NDMC at least weekly. Special consideration should be given to sites where Ag testing is not conducted in healthcare facilities. Testing sites can apply either paper-based (a standardized log sheet) or electronic (spreadsheet via email, SMS, tablets, mobile apps, web portals, etc.) reporting system to share testing data with the NDMC. The electronic approach allows for data collection at the testing sites and real-time data sharing with the center.

Surveillance test data should be reported to Africa CDC using the online SARS-CoV-2 test collection form[15]. The NDMC or designated center will complete this online form on a regular basis (weekly).

The positivity rate and test-per-case ratio are two crucial metrics for tracking the SARS-

14 Laboratory biosafety guidance related to coronavirus disease (COVID-19)
15 SARS-CoV-2 Test Collection Form – Africa CDC

CoV-2 epidemic. The positivity rate can be calculated as a percentage of the number of confirmed COVID-19 cases (tested either by RT-PCR or Ag RDT) relative to the total number of individuals tested. According to WHO, a positivity rate <5%, at least for the past 2 weeks, is an indicator that the epidemic is under control in a particular setting[16]. The test-per-case ratio measures the scale of testing relative to the extent of the epidemic. It is simply the inverse of the positivity rate data. WHO suggests approximately 10 - 30 tests per confirmed case as a benchmark for adequate testing[17].

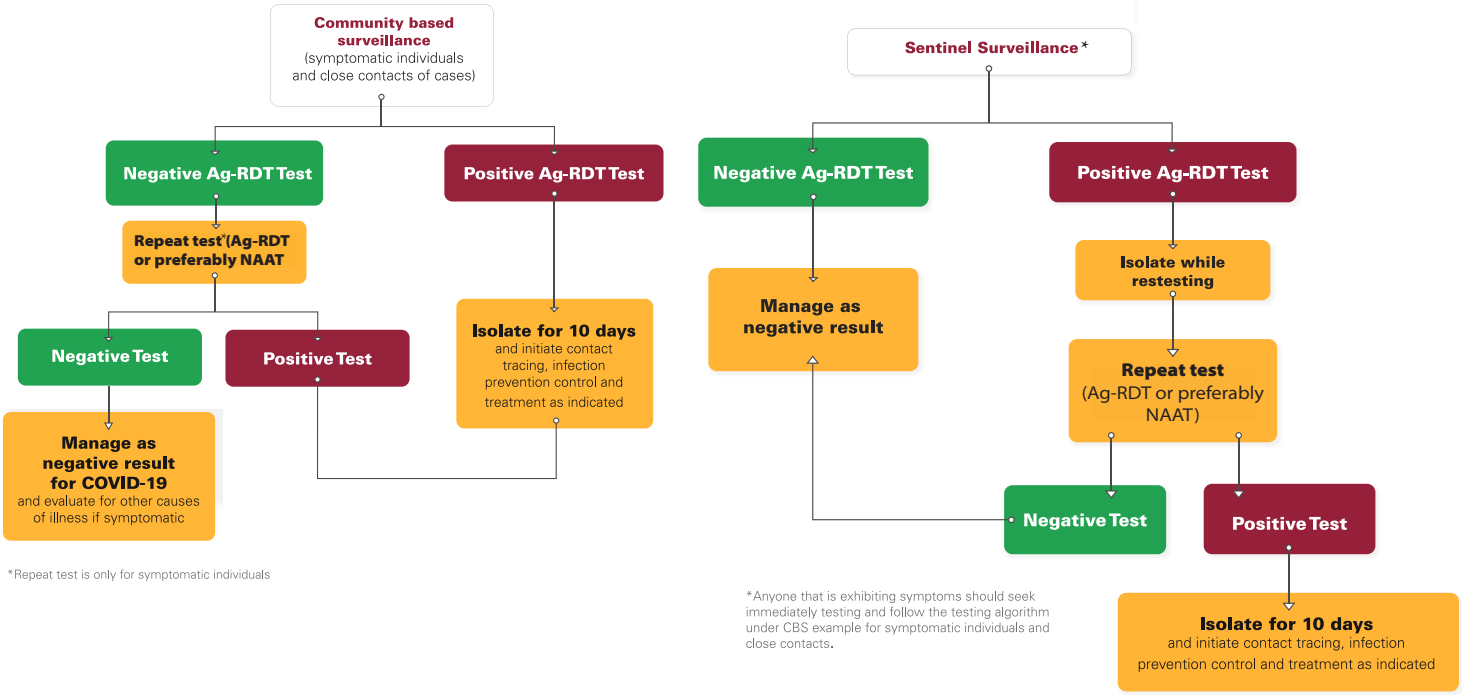
Confirmation of Ag-RDT results

Ag RDT test results interpretation should consider the clinical and epidemiological context of the person tested (symptoms, contact, exposure suspect, setting, etc.). In high-risk populations, positive Ag-RDT results may not require confirmation. Positive results are more likely to be true positives and can be interpreted as likely SARS-CoV-2 infection. If a person tests positive using the Ag-RDT result, they should follow country guidance to go into isolation (see below for more detail).

A negative result can be considered negative if a person has no symptoms or epidemiological link. Symptomatic individuals with negative results should however be retested using COVID-19 Ag-RDT again, or preferably NAAT where possible while the person is being evaluated for other potential causes of illness. While this person waits for their test results to return, they should follow country guidance to quarantine (see below for more detail).

Ag tests with high specificity (>99%) are preferable for surveillance in community settings or sentinel surveillance if low prevalence of COVID-19 is anticipated. Target populations with "unknown or low risk of exposure" include persons crossing borders or ports of entry, as well as persons in educational institutions, workplaces, hospitals admitted for non-COVID-19 cases, and other general asymptomatic populations (e.g. in random community screening or surveillance). A positive result in individuals with low risk of exposure or asymptomatic persons may require confirmatory testing, preferably NAAT due to a low likelihood of SARS-CoV-2 infection. Negative results are likely true negatives and can be interpreted as unlikely to be SARS-CoV-2 infection. For further information, refer to Interim Guidance on the Use of Rapid Antigen tests for COVID-19 Response – Africa CDC.

16 Public health criteria to adjust public health and social measures in the context of COVID-19
17 COVID-19 - virtual press conference - 30 March 2020 Speaker key: TJ Tarik Jasarevic TAG Dr Tedros Adhanom Ghebreyesus AN Antonio



Linking to on-going genomics surveillance

Routine genomic surveillance of SARS-CoV-2 is essential to detect, monitor and characterize the emergence of new virus variants that can result in increased transmissibility, disease severity, or affect the effectiveness of diagnostics, vaccines, and treatment. A subset of RT-PCR positive samples (cycle-threshold (Ct) value of less than or equal to 30) collected from the described surveillance systems should go for additional characterization and sequencing to monitor for the spread of known variants of concern such as Alpha, Beta, Gamma, Delta, etc. and emergence and spread of other variants of interest. The Africa CDC and WHO/AFRO have jointly developed an interim operational guidance on SARS-CoV-2 genomic surveillance in Africa[18], which provides further advice on sampling strategies and sample referral logistics for SARS-CoV-2 sequencing. To increase representativeness, particular attention needs to be given to the frequency of sampling (weekly or bi-weekly) and sampling across key groups (e.g. different age bands, diverse geographical distribution, different spectrum of disease and clinically significant cases such as fatal cases, vaccinated, immunocompromised, asymptomatic patients receiving any antiviral treatment, and re-infected cases).

18 Interim operational guidance on SARS-CoV-2 genomic surveillance in Africa: An updated guide

Linking Surveillance Outcomes to Interventions

Once a person tests positive for the virus, appropriate isolation, contact tracing and quarantine must occur to decrease transmission of SARS-CoV-2 and ensure the person receives adequate treatment. At a community level, other key interventions are crucial to mitigating primary and secondary harm of COVID-19, such as community engagement and risk communication to decrease stigmatization of those who are infected and ensure community awareness of current transmission risk, as well as guidance on how to prevent future spread of the virus and targeted vaccination.

Isolation and quarantine

Rapid identification and monitoring COVID-19 patients and contacts is the best means to stop transmission and assure medical treatment of ill persons in a timely and effective manner. All individuals who test positive for SARS-CoV-2 should be interviewed by local health authorities as quickly as possible to initiate contact tracing activities. All persons who test positive for COVID-19 must enter isolation immediately, with their identified close contacts promptly entering quarantine. Persons with mild disease and no risk factors can be isolated and managed at home as long as they can be cared for by family members and followed up by health workers. All should be educated about personal hygiene, basic infection prevention and control measures, and how to care for the COVID-19 infected individuals to prevent the household spread of infection.

In some communities, alternative isolation facilities may have been established by local health authorities. Cases and their contacts should be monitored by local health authorities on a regular basis to prevent viral transmission and to identify signs of serious disease such as significant shortness of breath that require medical professional attention. The patient and close contacts should adhere to isolation and quarantine criteria as established and monitored by national health authorities, and these rules may change as the vaccination status of the population increases.

Isolating persons who have been exposed to COVID-19 cases, either self-identified or detected through contact tracing, remains a crucial link in preventing community spread of the virus. Isolation and quarantine should happen in all phases of the pandemic.

Contact Tracing

Once a person tests positive and is put in isolation, contact tracing can be used to mitigate the spread of COVID-19, by identifying persons who have been in contact with confirmed cases, identifying settings or events where exposure may have occurred, and allowing for targeted interventions to contain sources of infection. Diligent contact tracing with daily follow up speeds up case identification, testing, and isolation.

While all persons identified as close contacts of confirmed cases should be tested for COVID-19 regardless of symptoms, contact tracers should prioritize anyone with symptoms for immediate testing as described in Africa CDC's Interim Guidance on the Use of Rapid Antigen tests for COVID-19 Response. It is also important to ensure that contacts who initially test negative understand that they may still develop COVID-19 and must **remain quarantined for 14 days**.

Contact tracing may not be feasible when intense community transmission is occurring and cases outside known transmission chains increase greatly. The recommended contact tracing activities for each epidemic phase have been provided in the Africa CDC Contact Tracing Guidelines but are summarized and adapted here:

Contact Tracing Objective

- **Phases 0-2:** Test all close contacts of identified cases
- **Phases 3-4:** Test all close contacts associated with new clusters of cases

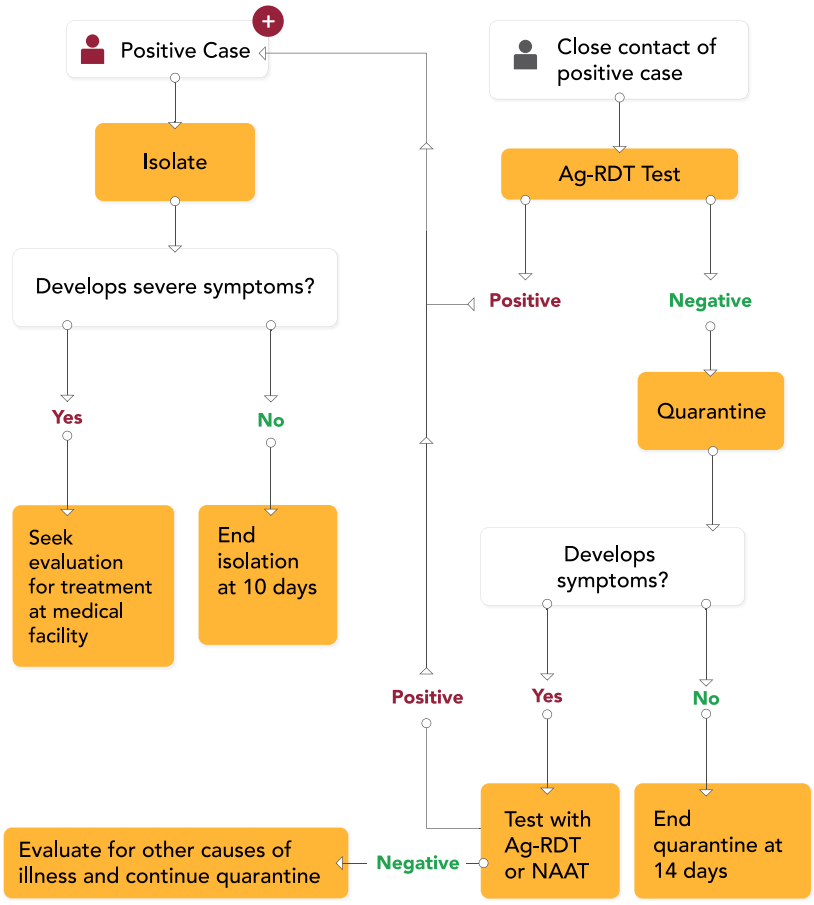
Contact Tracing Targets

Targets

- **Phases 0-2 Targets:** 100% of identified close contacts tested weekly
- **Phases 3-4 Targets:** 90% of identified close contacts of new clusters (defined as >1 confirmed case) tested weekly

Monitoring Indicators

- % of close contacts of cases/clusters identified
- % of identified close contacts of cases/ clusters tested weekly
- % tested that are COVID-19 positive



Risk communication

Effective advocacy to encourage self-reporting and care-seeking requires clear information, actionable advice, and willingness to listen as well as speak. Empowering and mobilising communities to act on their own behalf is essential to drive all other COVID-19 strategies forward. Trained CHWs are essential to translating COVID-19 information for the community and should be involved in both creating, communicating and evaluating community strategies. When continuously updated, CHWs retain community confidence and can help counter misinformation, negative perceptions, rumours, and stigma. To support this strategy, Africa CDC recommends building risk communication capacity of CHWs at national, provincial and local levels with clearly defined roles, responsibilities and structure, with particular focus on creating a Risk Communication and Community Engagement (RCCE)[19] plan and coordination across involved stakeholders. After CHWs have been trained in RCCE, monitoring and supervision should be provided on a regular basis, refresher training should be provided at least every six months or when there is a major development depending on how the epidemic or response evolves, and they should be provided with job aids and necessary IPC supplies during their course of work.

Public health and social measures

The introduction of PHSM systems implemented in a "tiered" or stepwise fashion, based on hotspot identification and incidence, are a core component of effective COVID-19 preparedness, response and risk communications. The indicators used to define each tier allow authorities to evaluate the amount of disease spread within a geographical unit and align with the appropriate policies to inform targeted interventions. In addition, a tiered PHSM system can help to alleviate the secondary burden of PHSMs by focusing stricter measures on identified hotspots and avoiding the national implementation of measures that are unnecessarily harsh or disruptive socially and/or economically. The PHSMs recommended are defined at each tier level, as well as by sector so as to provide clear systematic guidance at governmental, community, and business levels. However, personal protective measures (face masks, hand washing and social distancing) are recommended for Phase 1 and above.

Africa CDC guidance on how to create a PHSM tiered system for COVID-19 is available **here** and provides overall and country-specific advice using disease incidence, testing rates and hospital capacity as the key indicators for change. The guidance focuses on a national level,

19 WHO Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response

but Member States can use this guidance to adopt their own targeted tiered system, based on size and population of the geographical unit they wish to focus on. Assigning PHSM tiers at the subnational level may permit more precise targeting of PHSMs to the areas facing high levels of COVID-19 transmission. However, overly granular implementation should be avoided where testing numbers are low, as this can lead to unstable and inaccurate estimates of COVID-19 disease spread. For more details into how to create a PHSM tiered system, please see this instruction manual[20].

Targeted vaccination efforts

High-risk populations should be prioritized for vaccination as an immediate nation-wide rollout may be both unlikely and less effective, due to limited initial supply. High-risk populations should be defined as those who are medically vulnerable or those at high risk of exposure to COVID-19. Prioritized population groups include:

- Those with ongoing risk of occupational exposure, such as healthcare workers including frontline health workers
- Groups at higher risk of severe outcomes (e.g., including the elderly and immunocompromised)
- Those in close, congregated settings (e.g., long-term care homes or refugee camps)
- Populations with increased exposure due to geographic proximity to new cases or known hot spots that spike prior to outbreaks (e.g., border towns)

Strategies need to include plans to counter vaccine hesitancy and reach these high-risk groups in marginalised and /or hard to reach communities by leveraging networks of community health workers[21]. As vaccines become more available the goal is to fully vaccinate all eligible for vaccination. Methods for identifying, and ideally enumerating, these groups for vaccination planning purposes can be done by profession, health-associated factors, age, as well as based on an understanding of the anticipated locations or movement of certain populations that are at high-risk with low access to medical facilities (e.g., refugee populations, fishing villages where individuals may travel and regularly congregate at markets, churches, mosques, etc.). Lastly, the surveillance systems mentioned above can also be used to identify hotspot communities, which may also be prioritized for vaccination.

20 COVID-19 Tiered Public Health and Social Measure Framework for Africa
21 The Critical Role of Community Health Workers in COVID-19 Vaccine Roll Out

Long-term COVID-19 Surveillance Strategy

More than a year and half has passed since the SARS-Cov-2 virus was first reported in Africa and there is no evidence to suggest that the virus will be eradicated or disappear anytime soon. Therefore, medium and long-term public health planning should include integrating active and passive surveillance for COVID-19 into routine disease surveillance.

To meet the rapid need to set up and start capturing and reporting COVID-19 cases, many Member States have put in place COVID-19 surveillance systems in parallel with their existing indicator-based surveillance (IBS) systems. Many of these parallel systems are not linked to routine IBS or lab reporting systems, which makes system interoperability, maintenance, data sharing and reporting difficult.

Given that Member States will likely need to maintain a majority of the enhanced surveillance measures recommended in this guide for years to come, it makes sense to start integrating this surveillance into existing systems to allow for sustainability and interoperability. Existing public health surveillance systems built on frameworks like Integrated Disease Surveillance and Response (IDSR) may be the most versatile for transitioning pandemic tracking and response systems into routine surveillance; however, disease-specific systems (e.g. sentinel influenza, polio surveillance, etc.) have also been established for routine surveillance and may easily incorporate COVID-19 detection and reporting.

Where possible, all pandemic response efforts should identify opportunities to strengthen and integrate into existing surveillance systems. In planning for sustainable enhanced routine public health surveillance, funding sources, personnel requirements and logistics are critical considerations. One lesson of the COVID-19 pandemic is that the chronic underfunding of public health surveillance of the past has led to costly delays in disease detection and response. Laboratory networks, as well as NAAT and sequencing capacity, should be enhanced and expanded to detect and track trends in molecular epidemiology, including emerging virus variants. Long-term investments in healthcare systems, including creating better surveillance linkages between laboratory diagnostics and field epidemiology, will protect public safety and economies from unnecessary and dangerous shocks in the future.

Key Reference Documents

The Adapted Africa Joint Continental Strategy for COVID-19 Pandemic

The Interim Guidance on the Use of Rapid Antigen tests for COVID-19 Response: This Africa CDC document recommends how Member States can use rapid antigen tests to expand testing to subnational regions that do not currently have molecular testing capacity. By employing these test kits in this manner, cases can be rapidly identified and existing strain on laboratories can be reduced.

The Monitoring and Evaluation of COVID-19 Rapid Antigen Diagnostic Test Rollout in Africa: this framework proposes selected indicators and reporting requirements for better monitoring of the Ag RDT testing programme.

The Interim operational guidance on SARS-CoV-2 genomic surveillance in Africa: this Africa CDC & WHO update guidance offers practical guidance to the African Union Member States on implementing genomic SARS-CoV-2 surveillance.

The COVID-19 Tiered Public Health and Social Measure Framework for Africa PHSM: Developed as part of the Partnership for Evidence-Based Response for COVID-19 (PERC), this document and associated dashboard gives guidance to Member States on how to establish a tiered PHSM or alert-level system for COVID-19 at the national level to guide PHSM implementation. The framework recommends monitoring three core indicators (disease incidence, testing capacity, and hospital bed capacity) to determine the current tier, or alert, level. Subnational surveillance data will be critical to a system like this and help identify hotspots where PHSM implementation can be targeted.

The Recommendations for Stepwise response to COVID-19 and contact tracing guidance: This Africa CDC document provides a high-level mapping of outbreak stages with guidance on how to time the minimum uptake of different interventions that have been recommended by Africa CDC, driven by evidence and science.

The Africa CDC Event Based Surveillance Framework: This document provides guidance on the establishment of EBS at national, sub-national and community levels.

US CDC National Wastewater Surveillance System (NWSS) Guidance. This guidance goes into detail on how to establish a national wastewater surveillance system for COVID-19. This can be informed by existing Polio environmental sampling and adapted to the local country context.

Strategy Contributors

Africa CDC
- Emily Barigye Atuheire
- Marguerite Massinga Loembe
- Abebaw Kebede
- Kyeng Mercy
- Stephanie Salyer
- Senga Lucy Sembuche
- Akhona Tshangela
- Sofonias Kifle Tessema

NICD - South Africa
- Villyen Motaze

NCDC - Nigeria
- Mahmood Dalhat

Resolve to Save Lives
- Abdoulaye Bousso
- Colby A. Wilkason

UK Public Health Rapid Support Team
- Hilary Bower

US CDC
- James Zingeser

Appendix 1

Table 1. Epidemic phases and PHSM tiers

Epi phase	PHSM tier	Definition	Epidemiological status	Detection & response capacity
Phase 0	N/A	No COVID-19 cases	No reported cases in-country	N/A
Phase 1	Tier 1	Early stage outbreak	One or more imported cases AND/OR Limited local transmission	All cases are identified through surveillance and testing
Phase 2	Tier 2	Expanding outbreak	Increased local spread but all cases linked to known transmission chains Outbreak clusters with a known common exposure	Testing capacity is decreasing but still able to detect majority of cases
Phase 3	Tier 3	Advancing outbreak	Localised outbreaks start to merge One or more cases or deaths occur outside known transmission chains Sustained person to person transmission – multiple generations in transmission chains Cases are detected among severe acute respiratory illness (SARI) case with no known exposure	Surveillance and testing systems are inadequate to detect caseload, but are still functioning
Phase 4	Tier 4	Large outbreak with nationwide transmission	Widespread sustained community transmission Multiple generation transmission chains can be identified but most cases occurring outside of chains Community-wide transmission throughout all or nearly all of the country	Surveillance unable to be maintained, testing inade-quate, hospitals systems overwhelmed

Appendix 2

Table 2: Estimated number of tests needed to supplement Community-based Surveillance, based on previous wave frequency, duration, and peak incidence for waves 2-4 for all 55 AU Member States, February 2020 - September 2021

Country	Weeks between wave 2 & 3	Weeks between wave 3 & 4	Wave 2 weekly incidence (cases per 100k)	Wave 3 weekly incidence (cases per 100k)	Wave 4 weekly incidence (cases per 100k)	Average cases per week over last 42 weeks*	Cases per week at average peak incidence**
CENTRAL REGION							
Burundi			4.1			300	13,700
Cameroon			23.6			1,500	30,400
Central African Republic			9.8			200	5,500
Chad			2.3			100	18,800
Congo Republic	18		11.7	12.1		200	6,300
DR Congo	23		1.8	2.8		1,100	102,600
Equatorial Guinea			53.0			200	1,700
Gabon			55.5			400	2,600
Sao Tome and Principe			88.0			100	300
EASTERN REGION							
Comoros			75.1			100	1,100
Djibouti			136.7			200	1,400
Eritrea	22		9.2	14.7		200	4,100
Ethiopia			12.7	9.0		4,900	131,600
Kenya	19	20	14.4	17.3	16.5	4,100	61,600
Madagascar			15.4			700	31,700
Mauritius	23		2.0	13.1		300	1,500
Rwanda	24		17.9	69.8		2,000	14,900
Seychelles			2811.0			500	2,900
Somalia	16		0.3	7.8		400	18,200
South Sudan			14.5			300	12,900
Sudan	14		4.7	2.7		600	50,200
Tanzania			0.0			400	68,300
Uganda	12		3.3	10.0		2,000	52,300
NORTHERN REGION							
Algeria	15	35	10.0	16.8	23.7	3,200	50,300
Egypt	19		9.4	8.1		4,300	117,100
Libya	19		93.2	280.7		5,700	12,900
Mauritania	28		31.6	48.3		700	5,300
Morocco	24		98.6	180.4		14,200	51,500
Sahrawi Republic	16		27.8	41.7		100	700
Tunisia	14	11	165.6	123.4	464.1	14,100	29,700

Country	Weeks between wave 2 & 3	Weeks between wave 3 & 4	Wave 2 weekly incidence (cases per 100k)	Wave 3 weekly incidence (cases per 100k)	Wave 4 weekly incidence (cases per 100k)	Average cases per week over last 42 weeks*	Cases per week at average peak incidence**
SOUTHERN REGION							
Angola			6.6			900	37,700
Botswana	12		153.6	545.7		3,600	8,400
Eswatini	29		128.3	412.3		900	3,300
Lesotho	29		118.5	34.4		300	2,500
Malawi	26		36.3	27.1		1,300	21,900
Mozambique	26		19.9	42.3		3,200	35,900
Namibia	26		128.4	478.7		2,700	7,600
South Africa	25		220.7	226.0		48,100	132,500
Zambia	24		10.1	53.7		4,500	21,100
Zimbabwe	27		41.7	106.4		2,800	17,100
WESTERN REGION							
Benin	15		1.0	6.9		300	13,900
Burkina Faso	15		1.2	5.7		300	24,000
Cabo Verde			345.5			700	2,100
Côte d'Ivoire			10.9			900	30,300
Gambia	19		9.8	40.1		200	2,800
Ghana			18.7	11.3		1,700	35,600
Guinea	21		7.8	8.7		500	15,000
Guinea-Bissau	26		9.6	19.8		100	2,300
Liberia	28		2.0	22.0		100	5,900
Mali	17		3.3	6.6		300	23,300
Niger			1.9			200	27,700
Nigeria			5.5			3,100	235,800
Senegal	22		13.5	35.5		1,400	19,200
Sierra Leone	21		5.7	7.1		100	9,200
Togo	33		19.4	14.8		500	9,500

Average number of weeks between wave peaks		Average weekly incidence			Estimated range for tests needed for CBS per week	
21.3	22.0	93.1	80.1	168.1	1,141,800	1,646,700

Average waves per year	Average weekly peak incidence
2.4	114.4

*Average tests per epi week were calculated by taking the cumulative cases from epi week 46 in 2020 to epi week 34 in 2021 and dividing by 42, the number of epi weeks over that time period. Epi week 46 was chosen as the start as it was the middle of South Africa's second wave.
**Cases/week at peak incidence was calculated by using the weekly incidence averaged over waves 2-4, the higher of either the continental average of 114.4 cases/100k/week or the country's actual average during waves 2-4.

Table 3: Healthcare worker estimates* by African Union Member States, 2003-2019.

Country	Dental Professionals	Medical doctors	Nursing and midwives	CHW	Physio-therapists	Total Medical Professionals	Total per 100,000 pop	Approximate tests per month
CENTRAL REGION								
Burundi	4	1,084	7,642	11,845†	2	20,577	173	21,000
Cameroon	300	1,842	127	1,352‡	16	3,637	14	4,000
Central African Republic	12	324	927	ND	4	1,267	26	2,000
Chad	26	865	2,196	210‡	18	3,315	20	4,000
Congo Republic	29	530	4,638	700‡	2	5,899	107	6,000
DR Congo	181	6,418	93,326	1,500‡	ND	101,425	113	102,000
Equatorial Guinea	15	507	634	308	ND	1,464	105	2,000
Gabon	101	1,408	6,083	ND	43	7,635	347	8,000
Sao Tome and Principe	11	63	406	150	4	634	317	1,000
EASTERN REGION								
Comoros	45	123	500	800†	ND	1,468	163	2,000
Djibouti	19	201	655	500‡	3	1,378	138	2,000
Eritrea	16	215	4,971	ND	ND	5,202	149	6,000
Ethiopia	1,778	8,395	77,931	39,878†	ND	127,982	111	128,000
Kenya	2,232	8,042	59,901	86,500†	1,000	157,675	293	158,000
Madagascar	1,275	4,275	7,827	39,000†	ND	52,377	189	53,000
Mauritius	596	3,210	4,445	187	98	8,536	657	9,000
Rwanda	305	1,492	11,970	58,568‡	225	72,560	558	73,000
Seychelles	93	240	956	ND	9	1,298	1,298	2,000
Somalia	ND	309	1,502	200‡	16	2,027	13	3,000
South Sudan	27	ND	ND	12,000†	ND	ND	242 **	**28,000**
Sudan	8,497	10,683	47,882	4,716	207	71,985	164	72,000
Tanzania	1,280	3,015	31,940	ND	118	36,353	61	37,000
Uganda	1,240	6,918	52,907	1,402‡	114	62,581	137	63,000
NORTHERN REGION								
Algeria	16,212	72,604	65,359	ND	1,751	155,926	355	156,000
Egypt	22,174	74,923	189,579	1,400†	4,498	292,574	286	293,000
Libya	5,776	13,757	42,975	ND	ND	62,508	906	63,000
Mauritania	284	821	4,074	500	7	5,686	124	6,000
Morocco	4,855	26,003	49,412	200‡	377	80,847	219	81,000
Sahrawi Republic	ND	ND	ND	ND	ND	ND	242 **	**2,000**
Tunisia	3,810	14,892	28,739	ND	1,200	48,641	412	49,000

Country	Dental Professionals	Medical doctors	Nursing and midwives	CHW	Physio-therapists	Total Medical Professionals	Total per 100,000 pop	Approximate tests per month
SOUTHERN REGION								
Angola	109	6,400	12,554	ND	116	19,179	58	20,000
Botswana	327	652	12,300	716	53	14,048	585	15,000
Eswatini	36	107	4,706	4,000	18	8,867	739	9,000
Lesotho	90	138	6,866	12,000†	17	19,111	910	20,000
Malawi	31	649	7,957	9,928	40	18,605	97	19,000
Mozambique	620	2,570	14,354	6,632	93	24,269	78	25,000
Namibia	273	1,421	4,784	592†	155	7,225	289	8,000
South Africa	16,643	46,393	74,556	ND	7,908	145,500	245	146,000
Zambia	1,035	1,514	17,745	3,000†	62	23,356	127	24,000
Zimbabwe	602	3,026	27,934	15,888	439	47,889	321	48,000
WESTERN REGION								
Benin	60	763	3,575	ND	58	4,456	37	5,000
Burkina Faso	197	1,910	18,841	2,979	18	23,945	115	24,000
Cabo Verde	214	410	706	ND	ND	1,330	222	2,000
Côte d'Ivoire	533	4,173	16,860	ND	60	21,626	82	22,000
Gambia	44	252	1,423	1,150	5	2,874	120	3,000
Ghana	613	3,236	82,462	20,000†	324	106,635	343	107,000
Guinea	66	977	1,453	6,700	7	9,203	70	10,000
Guinea-Bissau	19	227	1,284	2,355	3	3,888	194	4,000
Liberia	44	168	2,564	200‡	6	2,982	58	3,000
Mali	175	2,454	8,409	110	4,378	15,526	76	16,000
Niger	22	900	5,013	ND	7	5,942	25	6,000
Nigeria	16,688	74,543	301,579	178,215†	4,971	575,996	279	576,000
Senegal	240	1,435	8,807	1,116	11	11,609	70	12,000
Sierra Leone	33	566	5,757	1,400†	1	7,757	97	8,000
Togo	48	627	3,753	7,086	117	11,631	140	12,000
							Avg 242 HCW /100K pop	~2,580,000 tests/ month

*Data source: WHO Global Health Workforce statistics database (Accessed on 28 Aug 2021); totals by health professional type were taken from the most recent year these data were available. The range in years for data presented in the above table are 2003-2019. Dental Professionals = dental assistants and therapists, dental prosthetic technicians, and dentists combined. CHW = community health workers. ND = no data available in database

†Africa CDC survey findings on community health worker status across AU Member States, conducted in November 2020

‡Africa CDC community health worker deployment census as of 07 October 2021 as part of the Partnership to Accelerate COVID-19 Testing (PACT) in Africa

**The continental average number of healthcare workers per 100k population was used since there were no other data available on number of healthcare workers in this Member State from our listed references.

Table 4: Teacher estimates* by African Union Member States, 2000-2019.

Country	Pre-primary teachers	Primary teachers	Secondary teachers	Post-secondary / tertiary teachers	Total Teachers	Teachers per 100,000 pop	Approximate tests per year
CENTRAL REGION							
Burundi	2,757	51,545	51,420	6,912	112,634	947	113,000
Cameroon	27,822	96,546	229,202	19,148	372,718	1,406	373,000
Central African Republic	338	9,756	4,357	724	15,175	316	16,000
Chad	664	44,691	43,065	2,316	90,736	553	91,000
Congo Republic	2,101	16,527	36,330	7,810	62,768	1,141	63,000
DR Congo	210	2,310	4,968	450	7,938	9	8,000
Equatorial Guinea	2,560	4,021	3,114	412	10,107	722	11,000
Gabon	515	12,961	ND	ND	13,476	613	14,000
Sao Tome and Principe	662	1,193	2,080	582	4,517	2,259	5,000
EASTERN REGION							
Comoros	534	4,428	17,740	540	23,242	2,582	24,000
Djibouti	18,222	544,039	324,324	28,877	915,462	91,546	916,000
Eritrea	1,603	9,028	14,872	1,322	26,825	766	27,000
Ethiopia	23,467	259,636	228,776	79,208	591,087	514	592,000
Kenya	110,819	266,511	413,502	24,558	815,390	1,516	816,000
Madagascar	40,521	126,649	160,454	11,805	339,429	1,225	340,000
Mauritius	2,290	5,639	10,038	1,607	19,574	1,506	20,000
Rwanda	7,163	43,878	59,441	7,126	117,608	905	118,000
Seychelles	167	636	698	279	1,780	1,780	2,000
Somalia	ND	12,870	9,008	ND	21,878	138	22,000
South Sudan	3,197	27,248	11,948	118	42,511	380	43,000
Sudan	41,270	ND	71,552	13,102	125,924	287	126,000
Tanzania	12,333	196,437	105,802	23,564	338,136	566	339,000
Uganda	27,641	207,238	109,499	14,119	358,497	784	359,000
NORTHERN REGION							
Algeria	18,397	222,838	ND	58,647	299,882	683	300,000
Egypt	59,630	530,666	1,188,090	213,157	1,991,543	1,947	1,992,000
Libya	2,486	-	74,332	15,711	92,529	1,341	93,000
Mauritania	1,883	16,630	18,058	924	37,495	815	38,000
Morocco	37,621	171,812	310,376	77,311	597,120	1,618	598,000
Sahrawi Republic	ND	ND	ND	ND	ND	2,797 **	17,000
Tunisia	16,458	71,228	174,560	22,410	284,656	2,412	285,000

Country	Pre-primary teachers	Primary teachers	Secondary teachers	Post-secondary / tertiary teachers	Total Teachers	Teachers per 100,000 pop	Approximate tests per year
SOUTHERN REGION							
Angola	12,440	95,827	151,994	9,946	270,207	821	271,000
Botswana	2,659	14,533	12,902	3,105	33,199	1,383	34,000
Eswatini	1,935	9,006	15,702	1,200	27,843	2,320	28,000
Lesotho	2,914	11,167	5,386	2,206	21,673	1,032	22,000
Malawi	32,361	83,431	14,528	1,920	132,240	692	133,000
Mozambique	-	121,488	57,384	28,208	207,080	662	208,000
Namibia	6,372	19,557	22,686	5,073	53,688	2,148	54,000
South Africa	28,902	249,103	365,963	6,603	650,572	1,097	651,000
Zambia	ND	78,099	45,217	ND	123,316	670	124,000
Zimbabwe	9,992	73,148	42,585	15,187	140,912	946	141,000
WESTERN REGION							
Benin	5,418	53,341	180,780	2,672	242,211	2,002	243,000
Burkina Faso	5,030	82,083	120,800	12,126	220,039	1,053	221,000
Cabo Verde	1,435	3,043	6,920	2,850	14,248	2,375	15,000
Côte d'Ivoire	9,618	96,255	77,178	18,666	201,717	764	202,000
Gambia	3,459	10,101	16,218	432	30,210	1,259	31,000
Ghana	84,412	168,546	375,828	36,236	665,022	2,138	666,000
Guinea	3,599	37,680	38,644	12,614	92,537	706	93,000
Guinea-Bissau	309	5,371	3,197	25	8,902	445	9,000
Liberia	13,658	28,468	35,024	4,486	81,636	1,601	82,000
Mali	6,677	65,485	106,036	963	179,161	883	180,000
Niger	5,643	67,285	58,450	7,044	138,422	572	139,000
Nigeria	60,189	574,078	780,854	133,950	1,549,071	752	1,550,000
Senegal	11,670	64,577	72,062	6,712	155,021	928	156,000
Sierra Leone	5,566	47,738	51,858	3,626	108,788	1,360	109,000
Togo	6,316	40,626	41,596	5,307	93,845	1,131	94,000
						Avg 2,797 teachers/ 100K pop	~13,189,000 tests/ month

*Data source: Education Statistics - All Indicators (Accessed on 28 Aug 2021), databank at worldbank.org; totals by International Standard Classification of Education (ISCED) teacher type were taken from the most recent year these data were available. The range in years for data presented in the above table are 2000-2019. Pre-primary = ISCED 2011 levels 01 and 02, primary = ISCED 2011 level 1, secondary = ISCED 2011 levels 2-3, post-secondary/tertiary = ISCED 2011 levels 4-8. ND = no data available in database

**The continental average number of teachers per 100k population was used as there were no data available on number of teachers in this Member State from our listed references.

Africa CDC, African Union Headquarters
P.O. Box 3243, Roosevelt Street
W21K19, Addis Ababa, Ethiopia
Tel: +251 (0) 11 551 77 00
Fax: +251 (0) 11 551 78 44
www.africacdc.org