

# The evolution of SARS-CoV-2 testing in Africa: Observations from the first 1 million cases

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**Background.** The coronavirus disease 2019 (COVID-19) is a communicable respiratory disease in humans caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first reported in Wuhan City, China, in December 2019. Egypt reported the first case in Africa on 14 February 2020. COVID-19 rapidly spread globally, leading to its declaration as a global pandemic by World Health Organization on 11 March 2020. At the outset, only two laboratories, in Senegal and South Africa, could confirm SARS-CoV-2 virus in Africa.

**Objective.** To describe the evolution of testing for COVID-19 from the period of onset of the first case on 14 February to the day Africa reached 1 million cases.

**Methods.** Data on COVID-19 cases were collected from the Our World Data database. Data on SARS-CoV-2 polymerase chain reaction tests were collected from the Africa Centres for Disease Control (Africa CDC) database. Evolution of testing was tracked using 30-day intervals at days 30, 90, 120 and 150, from day 1 on 14 February 2020. Information on continental strategies for testing was taken from the Africa CDC.

**Results.** Data from 54 African countries were reviewed, with Tanzania excluded. The number of countries reporting cases increased steadily from 1 on 14 February 2020 to 15 by day 30, and 50 by day 60. By day 90, all 54 countries had reported cases. There was an initial slow increase in reported cases, with a sharp increase reported from day 120 onward, until the 1 millionth case. It took 120 days to reach 183 152 cases, and only a further 53 days to pass the 1 million case mark. The average stringency index rapidly peaked from 29% at day 30 to 78% by day 60, and began to slow down to 75% (day 90), 66% (day 120), 60% (day 150) and 57% by the millionth case. The number of testing laboratories increased from 2 at onset to 38 by 24 February. The number of tests increased from 778 by day 30 to 125 199 by day 60, 1 063 695 (day 90), 3 412 806 (day 120), 6 222 522 (day 150) and 9 397 756 by the 1 millionth case. Four continental strategies were implemented during the period under review.

**Conclusion.** Although the African continent started slowly, capacity to test for SARS-CoV-2 rapidly increased, with almost all countries localising testing early into the pandemic. Challenges still exist that require an adequate supply of affordable, easy-to-use testing methods with shorter turnaround times.

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The coronavirus disease 2019 (COVID-19) is a communicable respiratory disease in humans caused by a new strain of coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first reported in Wuhan City, China, in December 2019.<sup>[1]</sup> Most infected people develop mild to moderate symptoms that include fever, dry cough, tiredness, diarrhoea, headache, loss of taste or smell and difficulty breathing or shortness of breath, among others reported in the literature.<sup>[2]</sup>

Early in the outbreak, the World Health Organization (WHO) recognised the central role of identification of cases through laboratory testing in the response by highlighting it as an integral part of the strategic preparedness and response plan for COVID-19.<sup>[3]</sup> Reverse transcriptase polymerase chain reaction (RT-PCR)-based tests that detect SARS-CoV-2 RNA have been the

gold standard for detection and confirmation of diagnosis, and become positive 1 - 3 days before onset of symptoms, with the highest viral load on the day of onset of symptoms.<sup>[4]</sup>

The rapid spread of the virus around the world led to the declaration of COVID-19 as a public health emergency of international concern in January 2020, and a global pandemic on 11 March.<sup>[5,6]</sup> The first COVID-19 case in Africa was reported in Egypt on 14 February, and by 14 May all African countries had reported at least one case of COVID-19.<sup>[7]</sup> By 5 August, the African continent recorded its 1 millionth case, approximately 6 months after the first reported case (Fig. 1).

South Africa (SA) has contributed the highest number of cases on the continent, followed by Egypt and Nigeria, making it the country with the 10th-highest caseload in the world (Fig. 1).

The limited diagnostic capacity on the African continent before the pandemic is well documented. The onset of the COVID-19 pandemic added another challenge to already strained health systems. However, the continent has made concerted and significant efforts to ramp up testing by adopting innovative testing strategies informed by the changing scientific evidence. We describe the evolution of testing for COVID-19 from the period of onset of the first case to the 1 millionth case.

## Methodology

Data on the total number of cases were collected from Our World Data, a collaborative programme between the University of Oxford and Global Change Data Laboratory that collects data on a number of areas related to the progress of the COVID-19 pandemic across the globe.<sup>[8]</sup> Data on the number of tests conducted were collected from the Africa Centres for Disease Control (Africa CDC) database, which collects information from member states. Descriptive statistics were used to describe the evolution of testing up to the 1 millionth case using the 30th, 90th, 120th and 150th day data and the day the 1 millionth case was reported. Day 1 was considered 14 February, the day that the first African case was reported in Egypt. The Africa CDC website (<https://africacdc.org/>) was used as the main source for different continental interventions aimed at boosting SARS-CoV-2 testing over the period under consideration.

## Results

### Evolution of the pandemic

Fifty-four African Union (AU) countries were included in the present study, with Tanzania excluded as it last reported cases in April 2020. Using 14 February, the day that the first SARS-CoV-2 case was reported in Africa, as day 1, the number of countries reporting cases increased steadily to 15 by day 30 and 50 by day 60, and by day 90, all 54 countries had reported cases. The total number of cases increased slowly up to day 120, increasing sharply until 5 August 2020, when the 1 million mark on the number of cases was surpassed. It took 120 days to reach 183 152 cases, and only

a further 53 days to reach 1 006 434 cases (Fig. 2)

As the pandemic evolved, the average stringency index rapidly peaked from 29% at day 30 to 78% by day 60, and began to slow down to 75% (day 90), 66% (day 120), 60% (day 150) and 57% by the millionth case. The stringency index is a composite measure based on nine public health response indicators, including closure of schools, and workplace and travel restrictions, rescaled to 0 - 100, where 100 is strictest.<sup>[9]</sup>

### Continental strategies to support COVID-19 testing

Four continental strategies were developed and implemented at continental level to respond to the pandemic and support COVID-19 diagnosis.

### Africa Joint Continental Strategy for COVID-19 Outbreak

A strategy was launched by the AU on 20 March 2020 with an objective to ensure the co-ordinated efforts of member states,

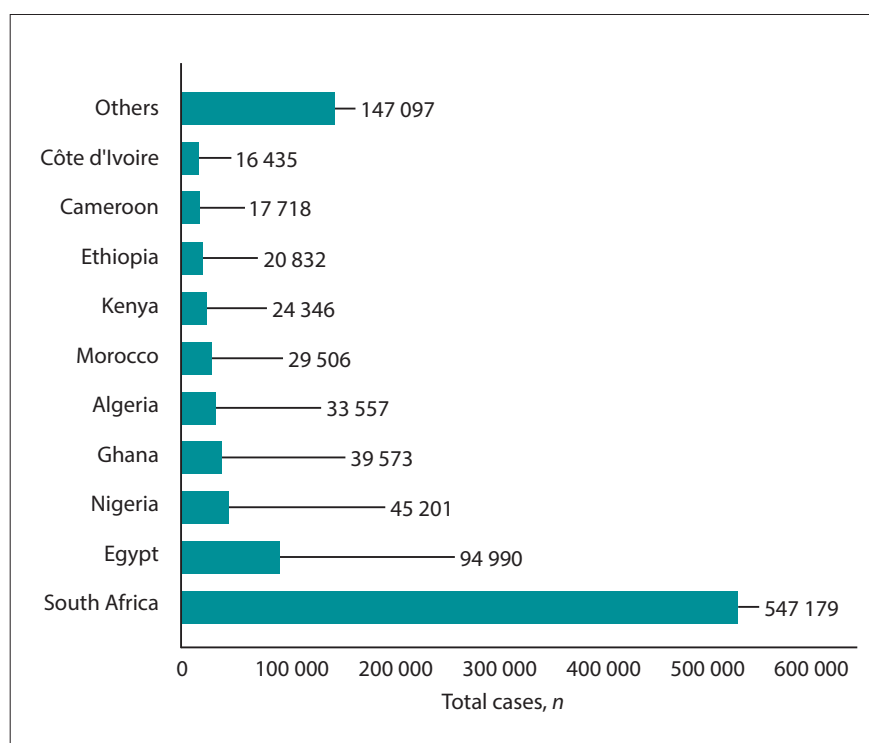


Fig. 1. Total number of confirmed cases in Africa by the millionth case.

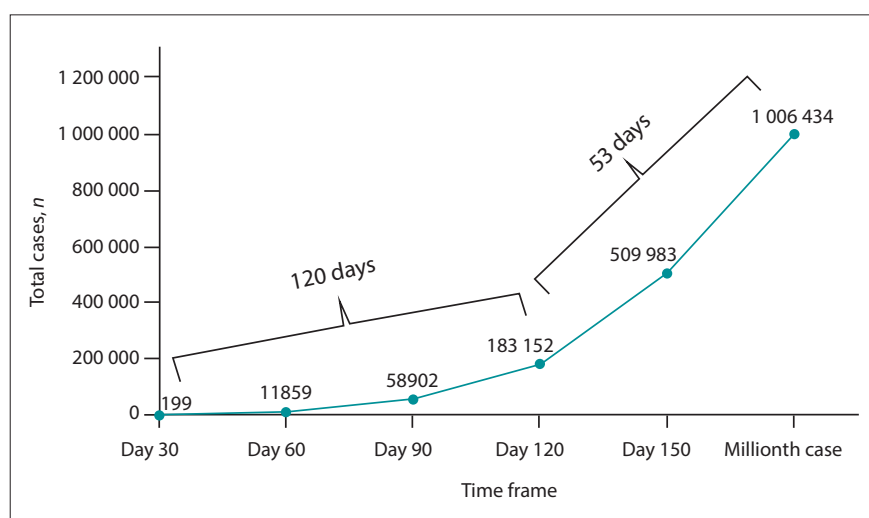


Fig. 2. Total number of confirmed cases every 30 days since first reported case in Egypt.

AU agencies, the WHO and other partners to create synergies and minimise duplication of efforts.<sup>[10]</sup> Of priority was ensuring quality-assured testing for COVID-19 diagnosis, through equipping and training public health laboratories, strengthening reference laboratories and specimen reference networks and evaluation of new diagnostic assays.<sup>[10]</sup>

### **The Africa Task Force for Coronavirus**

An operational unit of the Africa Joint Continental Strategy for COVID-19 Outbreak, the Africa Task Force for Coronavirus (AFTCOR) was tasked with co-ordination of supplies of reagents to SARS-CoV-2 testing laboratories, linking manufacturers directly with countries to guarantee supply of test kits, and creation and managing of an emergency stockpiles of reagents that are easily deployable to countries in the region.<sup>[10]</sup>

### **The Partnership to Accelerate COVID-19 Testing**

The Partnership to Accelerate COVID-19 Testing (PACT) was launched by the AU on 22 April 2020 to enhance testing, tracing and treating of all COVID-19 cases in a timely manner.<sup>[11]</sup> PACT set targets to conduct 10 million tests and establish a procurement platform for laboratory and medical commodities within 4 months of its launch.

### **The Africa Medical Supplies Platform**

A single online platform was established for countries to access medical supplies and diagnostic test kits through facilitated volume aggregation, easy payment facilitation and logistics and transportation of procured kits.<sup>[12]</sup>

### **Training and capacity building**

Over the period under review, the Africa CDC, in partnership with its regional and global partners, conducted training and capacity building in SARS-CoV-2 testing using different delivery methods: face to face where in-country experts were available and in-country travel restrictions were not imposed, and virtual training using scheduled webinars. A total of 800 laboratory personnel were trained in various areas of SARS-CoV-2 testing, including sample collection, transportation,

PCR testing, using GeneXpert and biosafety in the context of COVID-19.

### **Pooled procurement of SARS-CoV-2 testing kits and consumables**

The Africa CDC mobilised resources at continental level from the AU, partners and donors towards procurement of reagents and consumables for SARS-CoV-2 testing. In the period under review, 4.2 million test kits were procured and distributed to all 54 member states.

### **Evolution of COVID-19 testing**

Only PCR-based testing was considered as diagnostic for COVID-19 infection. Countries that did not have in-country capacity to test collected and referred samples to other countries for testing. At the onset of the epidemic on 14 February 2020, there were only two laboratories, in Senegal and SA, capable of testing for

SARS-CoV-2.<sup>[13]</sup> By 20 February, 38 countries had SARS-CoV-2 testing capacity, as reported by the WHO.<sup>[13]</sup> As the testing capacity increased, the number of tests also increased, from 778 by day 30 to 125 199 by day 60, 1 063 695 by day 90, 3,412,806 by day 120, 6 222 522 by day 150 and 9 397 756 by the 1 millionth test (Fig. 3).

To track the adequacy of testing, data on the case-per-test ratio were collected. Only data from day 120 after the first reported case were included. The number of countries testing within the WHO-recommended 10 - 30 tests per case ratio increased from 7 to 22 by the time of the 1 millionth case in August 2020 (Fig. 4).

### **Discussion**

At the onset of the epidemic in Africa in February 2020, there were only two countries on the continent capable of conducting confirmatory SARS-CoV-2

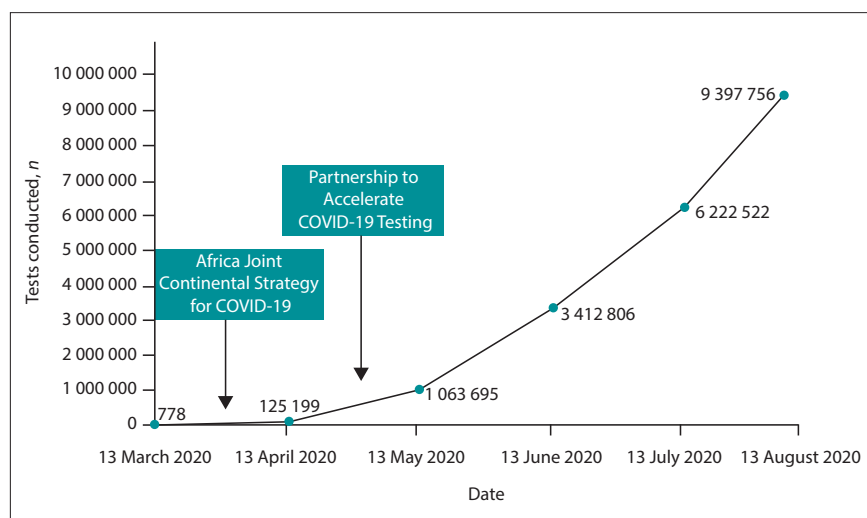


Fig. 3. Cumulative SARS-CoV-2 testing between day 30 and day of 1 millionth case.

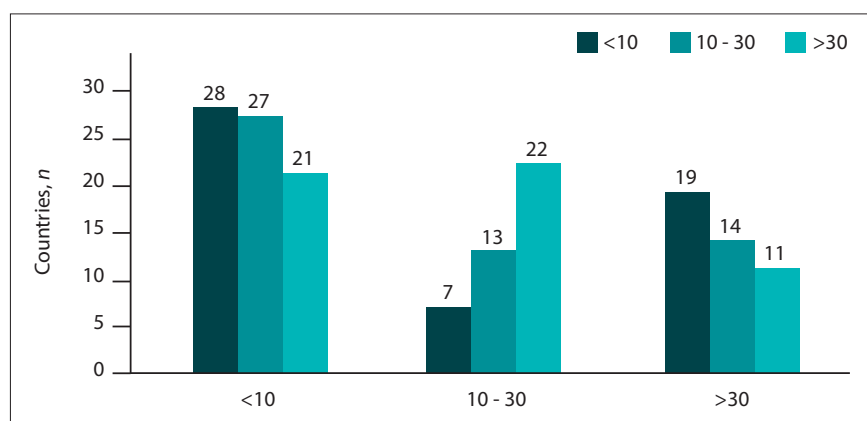


Fig. 4. Test-per-case ratio for the 54 African member states, June - August 2020.

testing. This posed a serious challenge to the readiness of the continent to respond to the soon-to-be-declared pandemic, as testing was central to the identification of cases and to monitoring progression of the epidemic.<sup>[14]</sup> The WHO strategic preparedness and response plan, issued in February 2020, also identified laboratory diagnostics as central to improvement of surveillance and tracking cases. The African scenario was an illustration of the chronic problem of underdeveloped health systems, with most diagnostic systems poorly resourced.

The devastating effects of the virus in China and Europe spurred African countries into action, seen by the sharp rise of the stringent index to 78% by day 60. This was characterised by a series of public health measures that included closure of international borders, limited in-country movement and lockdowns of various severity. However, testing lagged behind, with a sharp rise beginning to be observed only around day 90 in May 2020. This was due to several challenges. Even though a number of countries by that time had established diagnostic capacities, with 43 countries testing locally by April 2020,<sup>[15]</sup> there was immense pressure on global supply chains, and testing kits were not readily available. Several countries had started utilising existing PCR laboratories, formerly used for HIV testing, for SARS-CoV-2 diagnosis, with some rapidly acquiring and training staff on new PCR-based technologies. The repurposing of the Cepheid GeneXpert in March 2020 provided an alternative that did not require standard PCR testing. Laboratories, however, still suffered from unavailability of testing cartridges, especially in the Africa region. Therefore, the unavailability of test kits slowed down testing in the region.

In response to a solidarity call by the WHO Director General, Africa united to respond through several continental efforts to deal with the pandemic in the context of its weak health systems. The Africa Joint Continental Strategy for COVID-19 Outbreak and AFTCOR, launched in March 2020, coincided with the observed initial increase in testing. Both initiatives called for joint efforts in increasing testing capacity, equipping and training public health laboratories and strengthening reference laboratories and specimen reference networks. The Africa CDC, in collaboration with partners including the WHO, stepped up training and capacity building in the areas of sample collection, transportation and testing using the available testing platforms. The co-ordination of supplies of reagents to testing laboratories, and linking manufacturers directly with countries to guarantee supply of test kits, as part of these continental initiatives was meant to alleviate the inadequate supply of testing kits in the Africa continent. The PACT by the Africa CDC, setting a target of 10 million tests within 4 months of its launch, set up platforms for multilateral organisations and donor countries such as the Jack Ma Foundation, Germany, the European Union and China to support provision of testing kits to Africa.

These joint efforts at continental and country level saw an increase in the number of tests in the continent, reaching a million tests by day 60, and surpassing the 9 million mark by 5 August 2020. Concurrently, the number of countries conducting the WHO-recommended test-per-case ratio of 10 - 30 increased from 7 in June to 22 by August 2020. By the time of reporting the 1 millionth case, only 21 (39%) countries in the Africa region

were not conducting enough testing (test-per-case ratio <10), a significant improvement from only two testing laboratories in early February 2020.

Despite the existing challenges of inadequate health system capacity in the Africa region, the advent of SARS-CoV-2 spurred countries into action, supported by continental efforts. SARS-CoV-2 testing evolved from increased testing in just two laboratories in February 2020 to local testing in almost all countries. Notably, a number of countries by August 2020 were conducting adequate testing, as measured by the test-per-case ratio.

More efforts are still required to further improve the testing. The currently available tests require standard PCR laboratories whose infrastructural requirements are not readily available, given the already existing demand for HIV testing, and the advanced testing and skills needed mean that the test is not easily accessible. Although GeneXpert has brought testing outside of the standard laboratory, there are still limitations of cost and availability of test kits. Availability of easy-to-use and affordable test platforms is central to improving testing. Current efforts for antigen-based rapid tests need to be accelerated.

The current pressure on global supply chains may mean that even with availability of affordable test platforms, these will still take a long time to reach Africa. There is a need, therefore, to support local manufacturing by initially encouraging and supporting established manufacturers to diversify production to Africa, followed by establishment of full local manufacturing. In the short term, established manufacturers can be supported to expand production, with commitment of certain volumes to Africa, to ease pressure and allow for open competition. However, to attract this investment, the African continent has to create an enabling environment for business to thrive, including clear regulatory requirements, efficient export and import systems, favourable tax regimes and politically stable environments that allow long-term planning and investment.

## Limitations

Data for SARS-CoV-2 testing are not easily and readily available from many countries. The data sources used rely on information collected from focal persons in ministries of health and official government websites, which are not always updated regularly. There is not always transparency in official reports, given the economic and social impact that the number of reported cases may have on a country.

## Conclusion

Even though the African continent started slowly, its capacity to test for SARS-CoV-2 rapidly increased, with almost all countries localising testing early into the pandemic. Challenges still exist that require affordable, easy-to-use testing methods with shorter turnaround times.

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