

The spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): South African resilience and survival strategies

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Abstract

Containment of the COVID-19 pandemic relies on accurate data regarding symptoms, transmission, prevention, nature of the virus, strains, immunological factors, relevant demographic and behavioural factors, and control strategies. In South Africa, epidemiological infection data revealed 622,551 cases and 231 deaths per million population as of 29 August 2020. This study describes the strategies South Africa is applying in containing the COVID-19 outbreak that could be used to inform appropriate monitoring and surveillance in other settings, and to improve global health preparedness.

Introduction

The ongoing coronavirus disease 2019 (COVID-19) pandemic poses a serious threat to global health, with no substantial targeted therapeutic agents or vaccine^{1,2}. First emerging in early January 2020 in Wuhan, China³, the causative virus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), rapidly spread across borders. The first case in South Africa, in a citizen returning from Italy on 1 March, was identified on 5 March 2020⁴. SARS-CoV-2 infection is characterised by non-specific symptoms: fever, cough, fatigue, loss of taste, headache, body pain, sore throat, diarrhoea, difficulty in breathing, chest pain, and loss of speech. Many of these symptoms are also common to tuberculosis (TB), HIV infection, and other infectious diseases in sub-Saharan Africa. As of 29 August, SARS-CoV-2 had infected more than 25 million people and caused more than 840,660 deaths globally⁵. In South Africa, there had been more than 622,551 infections and 13,981 deaths⁵. South Africa, a country with almost 8 million people infected with HIV⁶ and between 333,760 and 764,480 cases of active TB annually⁷, already has the highest burden of SARS-CoV-2 infection in Africa and the fifth highest in the world. With the lessons learned from the HIV epidemic, the South Africa government advanced and enhanced several measures in containing the COVID-19 pandemic⁸.

The National Department of Health (NDoH) and civil societies instituted various measures, including mandatory working from home, a lockdown on some non-essential services and activities⁹, restricting all forms of social gatherings, physical distancing, sensitisation of communities, quarantining, and self-isolation, in an effort to contain the disease in compliance with the Disaster Management Act 2002 (Act 57 of 2002).

As the pandemic progresses, testing has been enhanced in hotspots and among specific vulnerable subgroups at high risk of severe disease, such as sex workers, elderly people, people with diabetes, people with HIV, and other immunocompromised groups¹⁰.

The pandemic has caused anxiety among South Africans, and uncertainty as to what the future holds. This is felt at an individual and community level, in the economy, and in the health system, and has affected general quality of life. Without doubt, these are challenging times, with many outcomes that require new and rapid adaptation. Apart from the COVID-19 outbreak, other issues arising are feelings of fear, economic pressure, joylessness, worthlessness, sleeplessness, and many other mental health issues seriously affecting the population¹¹.

The rise in daily new cases of COVID-19 worldwide may lead to health care system collapse and nosocomial outbreak among health care workers and patients in care facilities¹². The capacity to quarantine and isolate all nosocomial infected patients and health care workers may be a limiting factor in reducing transmission and mortality. Another challenge has been the heterogeneity in serological assays of SARS-CoV-2 by reverse transcription—polymerase chain reaction (RT-PCR), and the absence of a gold standard for identification of SARS-CoV-2-seropositive patients¹³. Findings by Whitman et al.¹³ indicate poor IgM and IgG development that differs among population groups. As infections continue to spread, interventions, measures, and strategies have been expanded to contain the disease. These include behavioural, biomedical, and community-level COVID-19, HIV infection, and TB prevention interventions and services in South Africa. Therefore, it is important to demonstrate structural interventions that facilitate the effective and safe delivery of individual-, community-, and national-level COVID-19 prevention measures.

1. Community engagement approach

Community engagement is an essential component of containment of all pandemic outbreaks¹⁴. In South Africa, the government and civil societies are involved in sensitising the population by increasing awareness of COVID-19 using all social outlets and information and using educational and communication materials to reach the population.

The teams involved are trained on COVID-19 information dissemination, including the symptoms, testing, treatment, prevention, and arising structural factors of stigmatisation, psychological hardship, and domestic violence resulting from COVID-19. Additionally, teams are trained on the importance of physical distancing, practising good facial, respiratory, and hand hygiene, and wearing required personal protective equipment (PPE), with safe programming being the centre of implementation in containing the COVID-19 pandemic. South Africa is using several community engagement processes for containing the pandemic, including the encouragement of local people to create fabric nose and mouth masks, training on how to wear these masks, and the identification and reporting of fake news.

The operation of essential services

Essential services were classified as medical and veterinary services, social work, counselling, care, and relief activities permitted for COVID-19 care and relief for the sick, mentally ill, elderly people, people with disabilities, and children. Identification of essential services necessitated the various government departments and civil societies to categorise services as essential and non-essential services¹⁵.

Prohibition of non-essential domestic and international flights

The Disaster Management Act 2002 (Act 57 of 2002)⁹ further outlines a restriction on all international and domestic passenger flights irrespective of the risk category of the country of origin except those flights specially authorised by the Minister of Transport for the evacuation of South African nationals in foreign countries¹⁶. This strategy was used by the government to be able to deal with the local COVID-19 epidemic.

Training and deployment of staff in community engagement projects

The NDoH, through the National Institute of Communicable Diseases (NICD), developed a COVID-19 training package for use nationwide to train frontline staff. This training package was adapted by partners such as the US Agency for International Development (USAID), which cascaded it to its implementing partners. The NDoH deployed 2600 contact tracers at the beginning of the COVID-19 campaign and 1308 community screening and testing teams across all nine provinces⁹. The NDoH has a total of approximately 31,000 persons as part of the screening team programme, with each team being made up of approximately nine persons. A “COVID-19 home visits programme” involving mass community-based screening, referral for clinic testing, quarantine of individuals suspected of having COVID-19, and appropriate care for COVID-19 patients was launched approximately 30 days after the first case. The programme includes the deployment of community health care workers to the field for door-to-door household screening. This strategy was adopted by each province by deployment of provincial community health care workers with appropriate PPE to undertake a house-to-house programme of “no-touch” screening for COVID-19 symptoms and to refer symptomatic people to clinics for testing.

South Africa emphasised that every single doctor must be employed, and resources were committed to realise this. This included doctors currently unemployed or who may be having difficulties in the private sector. All retired health care professionals were called to take temporary employment.

In addition, a 217-person strong Cuban medical team was also deployed to South Africa to assist in containing the pandemic. The government demanded the creation of distinct in-hospital areas for COVID-19 patients versus non-COVID-19 patients. Additionally, the government pronounced it mandatory to wear cloth face masks in public⁴.

2. Behavioural approach

On announcing the lockdown restrictions, the government emphasised the importance of adhering to the instructions and following public health guidelines. In this way, the country could bring the virus under control. The emphasis was on doing a few simple things to prevent the spread or transmission of the virus¹⁶. This included, but was not limited to the following:

Frequent handwashing with soap and water or use of an alcohol-based sanitiser.

Keeping more than 1 m distance between persons, especially those who are coughing and sneezing.

Avoiding touching the mouth, nose, and eyes because the hands may have touched SARS-CoV-2-contaminated surfaces.

When coughing or sneezing, the mouth and nose should be covered with a bent elbow or a tissue, with immediate disposal of the tissue.

Maintenance of physical distancing, use of face masks when in public, and the reporting of any signs or symptoms of COVID-19 by the public.

Mapping of COVID-19 hotspots

The South African government took further measures to identify areas defined as epidemiological hotspots (that is, more than five infected persons per 100,000 population, or areas where the infections are escalating⁴). This is where the country deployed experts and specialists who implemented measures to curb the spread. According to the government, hotspots required heightened levels of tracing of contacts of SARS-CoV-2-positive patients, ensuring that those who are positive remain in quarantine/isolation, and those who cannot self-quarantine are accommodated in quarantine facilities provided by the provinces. This strategy aimed at limiting the risk of further infection of other members of the communities, including their families⁴.

Building of community trust by promoting transparency and respecting public concerns

The government accounted to its citizens by providing daily press notices, media releases, and briefings. Government platforms included updates on the status of COVID-19. The government attempted to foster trust by briefing the country every time there was growing concern from the community or changes in the strategy. Each member of the interministerial committee also addressed the public regarding the departments they are leading. For example, when there was dissatisfaction about lifting the restriction on the sale of tobacco, the government revised and retracted this restriction lifting¹⁶.

Consistent use of personal protective equipment by health care providers

PPE includes medical-grade nose and mouth masks (combined surgical, procedure, and isolation masks of all types), N95 or similar disposable respirators and gloves (combined sterile and examination gloves of all types and

sizes), gowns (long-sleeved and water-resistant), goggles, and face shields. The government, in partnership with Business for South Africa, developed a centralised PPE procurement strategy to serve both the public and private sector. This was in response to the price hikes for PPE within the country⁴.

Strict hand hygiene in all settings

Hand hygiene has been at the centre of COVID-19 prevention. The South African government, through the Department of Water and Sanitation, provided emergency water to rural areas, informal settlements, and public areas. This was to ensure that the community adhered to strict hand hygiene measures. All supermarkets, public places, and workplaces were forced to comply with regulations for hand hygiene, including provision of sanitisers to all who access the workplace⁴.

Protocols that minimise COVID-19 exposure to staff and public

Various semistructured protocols, pamphlets, and communication materials have been developed to minimise the spread of COVID-19, including screening tools to be used on individuals before they enter shops, clinics and hospitals, motor parks, airports, and the premises of most organisations. These screening tools include temperature checks, and to an extent the recording of the main symptoms of COVID-19. These measures do not stop people from using the services but instead facilitate contact tracing⁴.

Coronavirus anti-stigma campaign

This includes the promotion of information, materials, and campaigns that fight stigma associated with COVID-19 as well as encouraging the public to report incidences of COVID-19-associated stigma offences. There are public telephone hotline numbers, SMS numbers, and e-mail addresses on various bulletins and signboards to which individuals can report such stigma-related cases to the government¹⁶.

3. Biomedical approach

This approach focuses on the use of biological indicators responsible for the detection, diagnosis, and treatment and management of COVID-19. This involves:

The establishment of a sensitive case definition that can identify and track possible COVID-19 cases. This was followed by the development of a structured protocol including screening tools that track and capture most suspected true COVID-19 cases on the basis of related symptoms and diagnosis

Decentralised management and the setting up of community screening centres for mass testing and treatment endeavours. Infection is confirmed by reverse transcription–polymerase chain reaction assays performed on nasopharyngeal swab specimens¹⁷. Apart from screening and testing of everyone in hotspots, testing was extended to anyone having symptoms. Those with symptoms were advised to contact the SARS-CoV-2 testing centre either through WhatsApp or by telephone. These individuals were attended to immediately for screening, testing, and isolation, and contract tracing was launched immediately¹⁷.

Clinical trials were prioritised, making the most of the country's unique position or advantages. In South Africa, there is a high TB and HIV burden, with many people taking antiretrovirals. It also has a particularly young population⁶. These elements were taken into consideration in all the

clinical trials to be conducted.

Genomic identification: South Africa's first successful genome sequencing of a locally collected sample of SARS-CoV-2 is now being added to an international database to help better understand the disease and to monitor mutation¹⁵.

Immunological estimation of the levels of IgM, IgG, cytokines, and lymphokines for vaccine, drug, and test development. In South Africa, rapid test validation is being investigated with use of local people who have tested positive for SARS-CoV-2.

Infection control and disease management capacity were increased when caring for those in isolation and quarantine. Various campaigns to promote development of new devices to better help medical professionals treat COVID-19 patients were useful.

Increase capacity to care for sick individuals. In South Africa, hospital beds have been repurposed for COVID-19 patients, and many new field hospitals have been built, especially in hotspots.

Additional, more aggressive, care and increased infection control for people in long-term care facilities.

Additional care for people with non-communicable diseases such as diabetes, hypertension, cancer, cardiovascular disease, and lung disease.

Additional care for people with communicable diseases such as TB and HIV.

In the absence of a vaccine or effective treatment, non-pharmaceutical approaches and interventions should be investigated, standardised, and widely distributed. Health care workers should receive detailed training on this.

Contact tracing

The goal is to stop COVID-19 transmission by identifying cases, supporting infected individuals, and increasing access to medical care and social services, while looking for those exposed to confirmed infected individuals to offer testing services. This limits transmission of both primary and secondary infections. Contact tracing was extended to those who had physical contact (within 1–2 m in 15 minutes without PPE) with a person with confirmed COVID-19 up to 2 days before illness onset. The contacts were notified and counselled (psychological issues may arise which may be handled with care). These people were informed and requested to restrict their movement and to self-quarantine at home and report any symptoms to the NICD alert number⁴. The infected individuals were isolated for care and treatment. Contact tracing difficulties occurred in high-density risk environments, such as mass transit services, demonstrations, homeless shelters, and people in disability facilities. Difficulties in contact tracing were further compounded by unreliable recall, people in limited resource settings, and by individuals' unwillingness to cooperate because of ethical considerations regarding private information and the right to autonomy⁴.

Discussion

Because of the wide range of measures and precautions implemented, the Worldometer of coronavirus cases showed that the daily infectious pattern in South Africa increased steadily from 30 May 2020, reaching a peak of approximately 13,000 cases per day in mid-July. There was a rapid decline to fewer than 3,000 cases per day by 23 August⁵ although the country drastically relaxed the lockdown rules to continue

with normal economic activities. This decline can be ascribed to the preparation that the country embarked on during the initial phase. This was heightened by public awareness campaigns surrounding virus transmission patterns and the importance of quarantine, isolation, social distancing, use of masks, testing, treatment, and prevention. As the country entered the winter season and began relaxing the shutdown of non-essential services instituted in May, the number of infections rose from hundreds daily to nearly 3,000 daily. This led to the government developing alternative makeshift hospital tents with infection control processes to accommodate newly infected individuals requiring admission and treatment. The 7–14-day period of quarantine and/or isolation of potentially infected individuals may have to be extended to 21 days to account for asymptomatic cases.

The COVID-19 outbreak has negatively affected lives, trade, tourism, national security, gross domestic product, development indicators, and citizen well-being. It is imperative to improve global health preparedness to better manage future epidemics¹⁸. Many countries are experiencing a decline in new cases of COVID-19, and life is getting back to normal with relaxation of lockdown rules, including the reopening of offices, schools, social amenities and parks, non-essentials services, and flights. Despite appropriate guidelines being issued, the World Health Organization is warning countries with declining cases and lax rules that a second wave of COVID-19 may emerge. Any contagious disease has the potential to be as dangerous as the Ebola epidemic¹⁴. The measures used to contain the deadly Ebola virus should not be different from the strategies being used to contain SARS-CoV-2¹⁴. People need to adjust their behaviour and change how they interact within social spaces. Little attention has been given to the roles and insights of the social sciences and humanities in the current COVID-19 crisis globally, and in South Africa in particular. We note that COVID-19 is a complex and potentially fatal respiratory disease, with death strongly associated with comorbidities. Currently there is no drug or vaccine for COVID-19, and thus reducing transmission relies on integrated mass screening and testing, contact tracing as part of a national surveillance system, and data sharing to enable case-based interventions and decision making. Also imperative is consideration of the needs of people at risk, and centres for management of public health responses, including dissemination of clinical and social support to people experiencing COVID-19 symptoms. Other methods include the support of people likely to experience depression and mental ill health among all age groups, and allowing the emerging data to inform the response strategy and assess the probability of an effective therapeutic or vaccine when it is available. Finally, the identification of policies that enhance and improve health preparedness in anticipation of the next public health threat should be prioritised.

Conclusion

This pandemic has highlighted poor health preparedness at the local, national, regional, and international levels. It has further exposed the inequalities within poor and developing countries such as South Africa. Health preparedness, which includes the ability to coordinate an epidemic response, may become as important as climate change, with increasing numbers of pandemics in recent years. Therefore, countries or regions should develop a common central commission that oversees the monitoring of emerging new pathogens in

their region. A comprehensive public health system can offer appropriate medical services for all residents, and effective national big data integration and analysis can be a valuable contribution to preventing further outbreaks. New legislation and law enforcement are necessary to facilitate tracking and tracing of infected individuals, isolate such individuals, and consequently protect elderly and immunocompromised individuals. In the case of South Africa, the National Insurance Fund could be of the utmost importance in ensuring equity in health care provision.

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Competing interests

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Ethics approval

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