Preserving lives or livelihoods? Examining the COVID-19 pandemic policy responses in Africa

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Abstract

Initial policy responses implemented by African governments, following the onset of the COVID-19 pandemic, are assessed, including lockdowns, restrictions of international travel, and other stringency measures (such as social distancing and contact tracing) to contain the spread of the COVID-19 pandemic from March 2020 to November 2020. Policy lessons on potential trade-offs between the economic and social consequences and the effort to save lives are drawn. We used novel data to establish causal relationships between infection rates of SARS-CoV-2 and stringency measures implemented by governments, as well as their economic and social consequences. The Instrumental Variable (IV) Method was used to identify the direction of causation. Our estimates showed that compliance with mobility restrictions led to a significant decline in infection rates, with the impact amplified in situations in which complementary measures were strong. The economic and social consequences were also very substantial, including contractions in real gross domestic product (GDP) and deterioration of household welfare. There were also a high incidence of lockdown-related violence and criminal activities. The lockdowns to fight COVID-19 could be most effective in the contexts of a strong health care system, efficient infectious disease control infrastructure, and community understanding. In other contexts, the trade-off between saving lives and preserving livelihoods could be very costly, and in extreme cases, lead to unintended consequences, such as severe hunger, violence, and permanent loss of jobs.

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As Africa braces for another wave of infections, many governments are grappling with the best approach to navigate through the COVID-19 pandemic[1]. The containment strategies applied at the onset of the pandemic may prove difficult to enforce when facing a possible new upsurge. Hence, it will be necessary to generate applicable restrictions that are consistent with location, economic activity, and living conditions. The economic disruptions experienced by many African countries since 2020 were largely the result of policy and administrative responses needed to slow down the spread of the COVID-19 virus. These included restrictions on mobility of people; closing border crossing points and air travel, both within and between countries; and many other measures of lockdowns that limited mobility as well as economic activities.

In this paper, we address the following research questions: how do we compare the impact of the policy responses on socioeconomic conditions, in comparison to their effectiveness in preventing the spread of the virus? What complementary measures are necessary for African countries to effectively manage a pandemic? Some of the lessons that emerged from the experiences of fighting the spread of the virus may be summarized as follows. Countries that experienced a significant reduction in the mobility of people from their normal daily routines had their infection rates lowered. Reductions in the mobility of people around the mean (–18%) led to a reduction in daily infection rate by 1% and fatality rates by about 0.6%, which is significant. Similarly, the Stringency Index around the mean (51%) could reduce daily infection rates by 1.5%. Lockdowns and stringency measures need to be complemented by other interventions. For instance, testing and tracing capacity had a significant role in reducing fatality rates. An average testing and tracing level achieved during the covered period led to reductions in daily fatality rates by 1.4%. Community understanding of the pandemic could reduce infections after a certain threshold (20%). Hence, increasing awareness even to the mean (40% of the population) could lead to a 1.6% reduction in daily infection rates.

The socioeconomic consequences of the health-protecting measured described above were severe. At the peak of the lockdown, real GDP growth declined by 5% in Africa, and a large percentage of households experienced job and income losses, which had serious welfare implications because of a lack of social protection programs. There was also a high incidence of daily violence and of crime related to the lockdowns. Studying the trade-off caused by stringency measures in Africa is of significant policy interest for two reasons. First, the World Health Organization (WHO) guidelines to contain the pandemic were focused on settings and conditions in developed economies and were not necessarily transferable to those prevailing in developing countries. The four main elements of the WHO guidelines include learning, isolating, washing, and treatment, which require access to information (radio, television, phone, etc.), decent housing (rooms for isolation and social distancing), and other amenities are unlikely to be met in poor countries. A recent report from the National Bureau of Economic Research detailed how difficult it is for poor countries to effectively follow the WHO guidelines[2]. Hence, the efficacy of these guidelines raises concerns in relation to the cost in developing nations. Secondly, unlike their counterparts in developed countries, recovery from a major shock is a very difficult process for countries in Africa and their households. Even short-lived shocks could lead to permanent or long-lasting damages in livelihoods—hence, the need for a nuanced, nimble, and cautious approach to the management of the pandemic. This includes a shift toward scaling up testing, vaccinations, close follow-up of confirmed cases, and strengthening the capacity of the health system to care for the sick. The role of community participation and compliance to basic guidelines issued by health authorities could take countries a long way toward managing the pandemic, while keeping the engine of the economy running. The rest of the paper is organized as follows: Section 2 presents the method that sketches the conceptual framework, highlighting the trade-off between stringency measures to contain the pandemic and the social and economic consequences. It also provides the estimation model used in the analysis. Section 3 describes the data; Section 4 presents results; and Section 5 concludes.

Methods

Trade-off between policy responses to contain the pandemic and economic and social consequences. Many African governments are confronted with the challenges of searching for effective but less costly policy and administrative responses that can contain the spread of the virus in the shortest time possible, without inflicting potentially 'irreversible' damage to the economy. For example, complete lockdown can significantly reduce infection rates and lessen the human cost. However, it can also lead to significant slowdown and contraction in economic activities. Striking the right balance is dependent on the epidemiological characteristics of the virus, socioeconomic factors, and resilience of institutions. Acemoglu recently explicated this dilemma using the typical model used by epidemiologists to capture spread of infectious diseases, such as COVID-19, popularly known as the SIR (Susceptibility, Infection and Recovery) model[3]. In a fixed population, an infectious disease has three groups of people. Those infected at time zero *I(t)*, susceptible to the disease, *S(t)*, and those that recover after being infected, *R(t)*. The path followed over time is captured in three nonlinear differential equations of the form:

$$\frac{dS(t)}{dt} = -\beta S(t)I(t) \quad [1]$$

$$\frac{dI(t)}{dt} = \beta S(t)I(t) - \gamma I(t) \qquad [2]$$

$$\frac{dR(t)}{dt} = \gamma I(t)\ , \qquad [3]$$

where β is a constant capturing "contact rates," and γ is the recovery rate, which under certain assumptions determine the cusp of the epidemic. Epidemiologists define a crucial parameter R_e, "which is the threshold value or tipping point that determines whether an infectious disease will quickly die out or whether it will invade the population and cause an epidemic"[4].It is given by the ratio of the contact rates and recovery rates as:

$$R_e = \frac{\beta}{\gamma} \qquad [4]$$

Since contact rates *(β)* is determined by the degree of interpersonal physical interactions, the policies that governments put into place to maintain social distancing *(θ)* will have important influence in curbing the epidemic and bring normalcy to society. Most researchers state the impact of social distancing on spread of the disease as follows:

$$R_e = \frac{\beta\theta^2}{\gamma} \qquad [5]$$

In this set-up, the actions of government authorities to enforce lockdowns and other preventive measures to reduce the spread of the disease depend ultimately on "social lifestyle;" the pattern of inequality in accessing health services, including protective resources, such as clean water, soaps, sanitizers, masks, etc.; culture; trust in government institutions; and availability of resources to protect people vulnerable to starvation, fatalities and other related hazards caused by the pandemic. Hence, β and θ become, in effect, socioeconomic variables of great interest, which can determine the path of the pandemic and its consequent short-, medium-, and long-term impacts on the economy. Unpacking this relationship, therefore, becomes relevant for understanding the macroeconomic impacts. For example, Acemoglu et al., Giannitsarou et al., and Hausman and Schetter outlined an optimal policy response that combines “targeted” lockdowns for high-risk groups in the population while allowing “low-risk” groups to function safely without disrupting economic activities[5,6,7] This requires an elaborate information base that is beyond the reach of many countries in Africa. For the purpose of this study, linear relationships between outcome variables (infection rates, fatality rates and change in economic activity, proxied by monthly rate of growth in nightlight illuminations) and explanatory variables (various measures of lockdowns, community understanding of the virus, testing capacity, etc.) are estimated. The general form of the econometric model is:

$$\frac{\partial y_i}{y_i} = \alpha + \theta \frac{\delta x_i}{x_i} + \beta z_i + u_i + \epsilon_{it} , \qquad [6]$$

where $\frac{\partial y_i}{y_i}$ represents the rate of change in the outcome variable, such as daily infection rates, daily fatality rates, or monthly GDP in the i^{th} country. The term $\frac{\delta x_i}{x_i}$ represents daily rate of reductions in mobility rates or change in the Stringency Index in the i^{th} country. z_i represent other control variables, such as community understanding of the pandemic, testing, and tracing capacity, subregional dummies, etc. The last two terms of Equation (6) represent unobserved, country-specific, time-invariant factors and the random error term, respectively. Infection rates or fatality rates are not instantaneously related with lockdowns or stringency measures due to time lags needed for the policy responses to take effect. Hence, the Ordinary

Least Squares method is not appropriate. Specific methods of estimation are reported in the Results Section.

Data sources

The paper used the following data sources to address the research issues. Data on the Stringency Index was obtained from Oxford University, which has constructed a single index with a range of 1 to 100 that aggregated about 20 indicators of government policy responses, spanning containment and closure policies, economic policies, and health system policies[8]. The data are available for 50 African countries. Data on mobility of people were used from Google, which reported percentage change in the daily movement of people in each country to specific locations, such as workplace, retail stores, parks, etc.[9] Epidemiological data on COVID-19 was obtained from Worldometer[10]. To capture impact on economic activity, the paper utilized monthly nightly data, using the methodology by Elvidge et al. to map anthropogenic lighting present on the earth's surface[11]. The data have been used extensively to proxy economic activity and measure real GDP growth, for example, by Henderson et al[12]. In this paper, linear relationships between outcome variables (infection rates, fatality rates and change in economic activity, proxied by monthly rate of growth in nightlight illuminations) and explanatory variables (various measures of lockdowns, community understanding of the virus, testing capacity, etc.) is specified. Specific methods of estimation are reported in the Results Section.

Results

Policy responses to contain the spread of COVID-19 pandemic in Africa. Most African countries have taken heed of the advisory notices released by WHO in the early stages of the

COVID-19 pandemic, concerned by poor health systems and health infrastructure for coping with massive infections. Early in March 2020, most countries began taking serious measures to contain the movement of people. They also introduced various measures to prepare the health sector and assistance programs for people who could potentially be affected by the lockdown measures. To capture these measures, Oxford University introduced the Stringency Index that essentially measured "intentions" and "policy directives." Not all countries, however, enforced restrictions to the same degree of intensity and comprehensiveness, and certainly, the compliance has not been uniformly applied. Fig. 1 suggests that compliance generally has been correlated with containment directives issued by governments, as captured by the Stringency Index, but the correlation is not that strong. The variance is more pronounced in countries with the highest Stringency Index, where compliance on mobility tends to be weak.

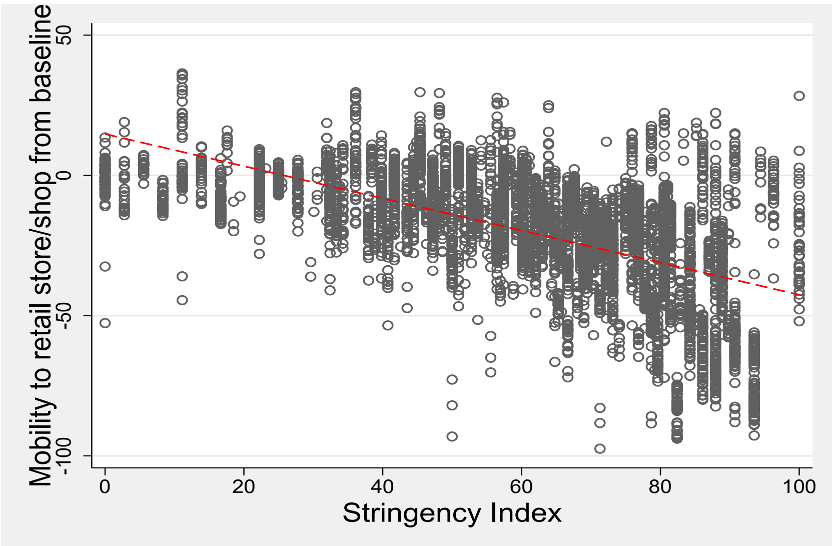

Fig. 1 | Containment policies and compliance in Africa

Source: Authors' computations based on data provided by Google[9] and the Stringency Index by Oxford University.[8, 9]

How effective has the policy responses been in containing the spread of the virus? The conventional wisdom is that lockdowns are helpful in slowing the spread of the virus, but there is no clarity how stringent they should be and for how long. As a result, African governments have taken different approaches to the lockdown from moderate to stringent approaches, depending on their perception of the severity of the spread and the practicability and costliness of the lockdown, and others facing political elections have been conscious of the cost of lockdowns.

Stringency measures take time to yield observable shifts in infection rates due both to the delays in detecting positive tests to the virus and compliance rates to the stringency policies. It is also possible that governments tend to enforce stringency measures in response to rapid spread of the virus. Hence, Ordinary Least Square methods yield biased and inconsistent estimates. Table 1 reports results from Generalized Methods of Moments (GMM) regressions in which 2-week and 10-day lags of all the explanatory variables (Stringency Index, mobility of people, and community understanding of the pandemic) were used as instruments. The IV-regression meets the overidentification criterion, as indicated by Sargan's test with the null hypothesis that all instruments are identified. The first-stage regression of the instruments also suggests that the lagged values are relevant instruments, as indicated by a high F-test.

Results show that reductions in mobility of people around the mean (–18%) could lead to reduction in daily infection rates by 1% and fatality rates by about 0.6%, which is significant. Similarly, the Stringency Index around the mean (51%) could reduce daily infection rates by 1.5%. In comparison to results from developed countries, however, the effectiveness of lockdowns tends to be low. For example, in Switzerland, a 1% decrease in mobility of people led to an 0.88 to 1.11% reduction in daily infections[13] while, in our case, the figure was

0.05%, which is very low for making a meaningful impact in slowing down infection rates within a reasonable period. To see the difference, for the average reduction of mobility of people experienced in Africa, daily infection rates would be cut by half within around 70 days. If lockdowns were as effective as in Switzerland, however, it would take only 4 days. We also note that there has been no clear agreement among experts on the effectiveness of lockdowns in stemming the COVID-19 pandemic, due to the complex factors at play, including demographic profile, living conditions, etc. See, for example, Violato et al.[14]

Hence, lockdowns and stringency measures need to be complemented by other interventions. For instance, testing and tracing capacity had significant roles in reducing the fatality rate. An average testing and tracing level achieved during the period covered led to reductions in daily fatality rates by 1.4%. Community understanding of the pandemic could reduce infections after a certain threshold (20%). For example, if community understanding reaches 40% of the population, it could lead to 1.6% reduction in daily infection rates.

Table 1 | Impacts of lockdown measures and community understanding of COVID-19 on daily infection (GMM estimates)

	Δ log daily infection rate	Δ log daily fatality rate	Δ log daily infection rate	Δ log daily fatality rate
Change in mobility of people to retail stores from baseline	0.0520***	0.0237*		

	(3.59)	(–2.36)		
Stringency Index			–0.0297*	–0.0081
			(2.53)	(1.39)
Community awareness	0.131**	0.0920*	0.0977*	0.126***
	(2.6)	(2.11)	(2.32)	(3.81)
Squared community awareness	–0.00327*	–0.00263*	–0.00152	–0.00199**
	(–2.50)	(–2.26)	(–1.61)	–2.94)
Test and tracing index	–2.62	–2.36*	–1.66	0.331
	(–1.64)	(–2.35)	(–1.06)	(–0.49)
Constant	0.823	0.762	0.852	–1.02
	–0.81	–1.02	–0.9	(–1.68)
Sub-region dummies	YES	YES	YES	YES
First stage regression F-test (p-value)	0.000	0.000	0.001	0.000
Sargan’s overidentification test	0.11	0.11	0.67	0.67
Number of observations	2,415	4,861	2,993	8,767

Note: t statistics in parentheses, * $p<0.05$, ** $p<0.01$, *** $p<0.001$. Δ⇒ rate of change.

The impact of lockdowns on economic activity and welfare in Africa. It was expected that the policy responses in the wake of the COVID-19 pandemic could cause disruptions in economic activities, including loss of jobs and income, and potentially, significant human suffering, including starvation, violence, and loss of learning opportunities for children. Thus far, the exact impact has not yet been ascertained across Africa due to lack of data; what is available is simulations using macroeconomic models. Instead, we rely on and report in this paper actual changes in economic activity proxied by nightlight data, which recently have been used as reliable source to estimate GDP growth[15]. As countries develop, the source of growth in GDP per capita tends to be technology intensive rather than light intensive. Hu and Yao estimated an elasticity of around 2.5% of nightlight data growth with respect to GDP per capita for low-income countries[16]. It can then be inferred that during the height of the lockdown (with a decline in mobility between 40–60%), real GDP of a typical African country may have declined by 5%.

Table 2 establishes a robust relationship between lockdowns and growth in nightlight illuminations. The results from the fixed effects regression model show the impact of change in monthly mobility of people on nightlight illumination. Controlling for unobserved time-invariant factors and time fixed-effects, a 1% decrease in mobility of people could lead to a 0.01% reduction in nightlight illumination, or equivalent real GDP growth. A 1-standard deviation decline in mobility (about 20%) could lead to a 2% decline in real GDP growth.

Table 2 | Fixed effects regression of monthly rate of growth in nightlight intensity and lockdowns in Africa

Change in mobility from baseline	0.0147***	0.00778*
	0.001	–0.033
March		–1.038***
April		–0.929***
May		–1.265***

June		–1.265***
July		–1.265***
August		–1.094***
September		–1.200***
Constant	0.422***	1.301***
N	220	220
R-sq	0.157	0.571

Source: Authors' computations

The consequent impact on employment and household welfare is self-evident. Josephson et al. reported, based on a high frequency phone survey, that nearly 256 million individuals in Ethiopia, Malawi, Nigeria, and Uganda lived in households that have lost income during the pandemic[16].

Table 3 reports the percentage of households that lost their jobs and incomes at the height of the COVID-19-related lockdowns in 10 African countries. Loss of jobs and income together could lead to a high risk of starvation in a situation where social protection programs, or safety nets, are not widely in place. The percentage of households that reduced food consumption in the wake of job and income loss is very large in many cases. Many households received transfers from families and friends in this time of crisis.

Table 3 | Job and income loss, and coping strategies in Africa due to the COVID-19 pandemic (%)

Country	Job loss	Income loss	Food consumption reduced	Transfer received
Burkina Faso	20.78	45.12	46.08	45.92
Chad	33.05	58,65	43.67	49.43
Djibouti	34.76	17.18	43.11	14.94
Ethiopia	20.00	50.00	23.00	13.00
Kenya	12.00	NA	40.00	9.00
Malawi	25.43	67.43	49.47	67.12
Mali	58.54	51.14	49.25	38.39
Nigeria	65.10	72.90	56.87	14.22
South Africa	37.10	41.00	26.00	16.00*
Uganda	54.16	52.87	25.79	22.50

Source: Authors' computations based on the World Bank High Frequency Phone Survey

Note: *Government transfer

Finally, the lockdowns caused significant social disruptions in Africa, leading to an elevated incidence of violence (Fig. 2). The more stringent the policy measures that restricted mobility and compliance were, the higher the incidence in conflicts, which could partly reflect the institutional weakness in enforcing such large-scale responses. Law and order have not taken deep root in many countries in Africa, further suggesting the fragility of sustaining lockdowns for an extended period.

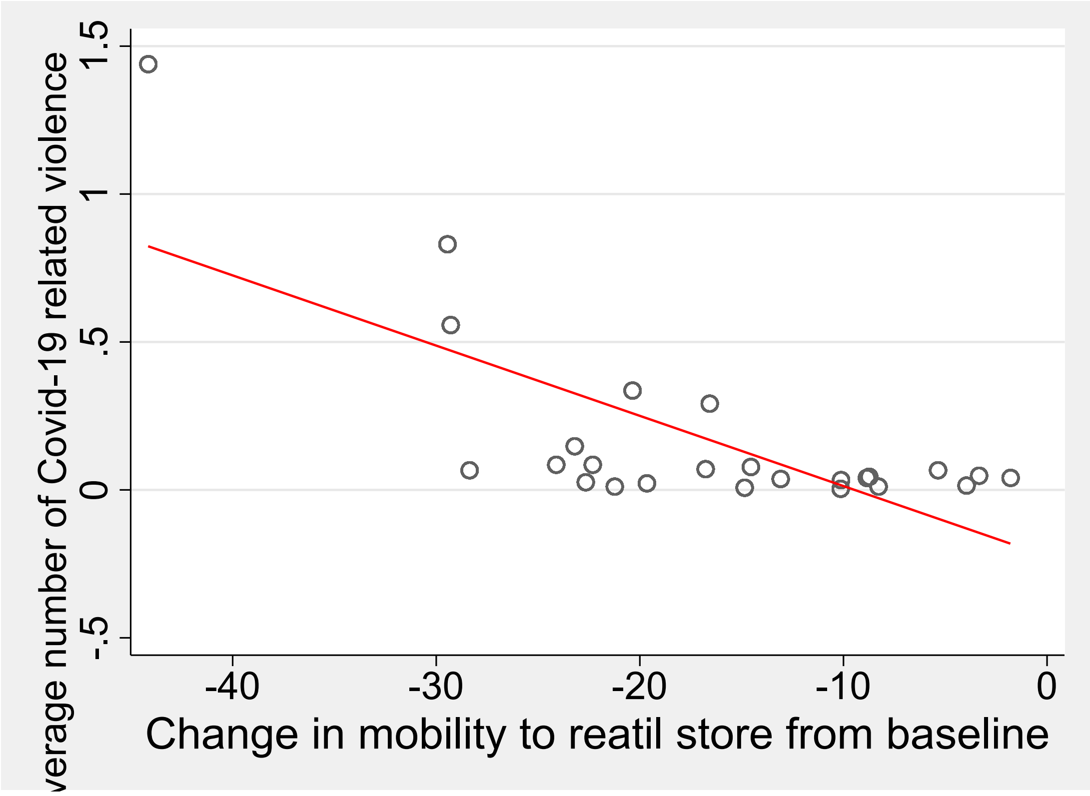

Fig. 2 | COVID-19 pandemic-related violence and lockdowns in Africa

Concluding remarks

The end to the COVID-19 pandemic is not yet in sight, and the appearance of new mutants suggests that the pandemic may continue in one form or another indefinitely. Return to the early days of stringency measures does not seem likely. There also seems to be fatigue in complying with the movement restrictions and economic lockdowns across the continent. As economic activities continue to decline, the common approaches of containment may become difficult to enforce for extended periods. Governments are hard pressed to develop approaches that would slow down the spread of the pandemic without significantly hurting the economy. The results reported in this paper showed that stringency measures and reductions in mobility of people led to significant reductions in infection and fatality rates.

However, we do know that in countries like Kenya where targeted social protection has been designed and implemented during the pandemic, it has effectively reinforced the positive impact of limited lockdown and slowed the infection rates in slums, while at the same time protecting livelihoods. In addition, for such locations, it is the food supply chain protection and preventive measures, like masks, targeted restrictions on large gatherings (funerals, weddings, political rallies, etc.) and movements, and sanitization that may matter most to containing the spread of the virus rather than blanket lockdowns.

The COVID-19 pandemic, unfortunate as it may be, also offers opportunities for undertaking long overdue reforms in health systems, social protection schemes, resilient food security strategies, health infrastructure upgrades, and community participation in public affairs. In addition, the pandemic also offers an opportunity for the fragmented continent to forge ahead and create a genuine Pan-African regional integration process, which could be an important risk-sharing mechanism; protection of jobs and movement of goods and services as well as development of markets that is needed for a speedy economic recovery. There is currently a lot of discussions about taking advantage of this pandemic to reshape African economies, reform institutions, and even economic management. Usually, pandemics like the present one, while a heavy challenge, also offer opportunities to move toward a more sustainable and inclusive economic environment. It should be noted that vaccines and their wide distribution could provide an important buffer in which Africa may need to create capacity for production and distribution to safeguard its population from the next pandemic.

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