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Policy and research frame of the coronavirus disease 2019 (COVID-19) pandemic: reflections on urban informality

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ABSTRACT

How has the informality of urban slums exposed a gap in policy formulation and research questions in the wake of the coronavirus disease 2019 (COVID-19) pandemic? This paper seeks to identify the appropriate questions and policy frame that would assist future researchers and policymakers on the subject of pandemics in densely populated urban settlements. The authors argue that the nexus between asking the appropriate questions and developing appropriate policy response measures during a pandemic can significantly impact the outcome of the response. The paper examines how the government of Kenya's response to the COVID-19 pandemic reveals a deep-rooted socio-economic and cultural inequality when "blanket" policies are adopted without taking into consideration the unique dynamics characterizing the society. The findings show that the effectiveness of implementing COVID-19 containment policies such as lockdowns, the cession of movement, working from home, distance learning, and social distancing are affected by other factors such as the nature of jobs, one's income levels, where someone lives, cultural beliefs, access to water, sanitation, internet, and medical facilities. This means that a significant number of people within the society experience a double tragedy from the pandemic and impact of government response measures. Yet most of the existing literature has focused on the causes, spread, and impact of the pandemic on health institutions, economies, and public health with little emphasis on the impact on policy measures especially on the vulnerable segments of the society. This paper, therefore, looks at the question of how the various public health intervention strategies disrupt or construct the livelihood of the already complex informal settlement. It provides policymakers and researchers with a number of questions that can frame policy and research during a pandemic with important consideration to urban informality.

1. Introduction

On January 7, 2020, a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, previously provisionally named 2019 novel coronavirus or 2019-nCoV), was identified from the throat swab sample of a patient. The disease caused by SARS-CoV-2 was called coronavirus disease 2019 (COVID-19). This disease was later declared a public health emergency of international concern on January 30, 2020 by the World Health Organization (WHO). This is the 3rd outbreak worldwide caused by the viruses from the *Coronaviridae* family. The previous two were the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002, Guangdong Province of China; and the Middle East respiratory syndrome coronavirus (MERS-CoV), detected in Saudi Ara-

bia in 2012.[1] The coronaviruses are large, enveloped, single-stranded RNA viruses infecting mammals and birds. These viruses can lead to severe lower respiratory tract infections and acute respiratory distress syndrome.

The relationship between public health intervention strategies and livelihood in informal settlements during this pandemic has not been well integrated into the current studies and policy responses to curb the virus's spread. This question is particularly critical for cities with poor public health systems, undocumented migrants, and densely populated informal settlements because of social distancing difficulties. However, this socioeconomic emancipation is not a striking claim for spatial marginalization. The lack of an articulate policy question seems to be the missing link for researchers and decision-makers tasked with dealing

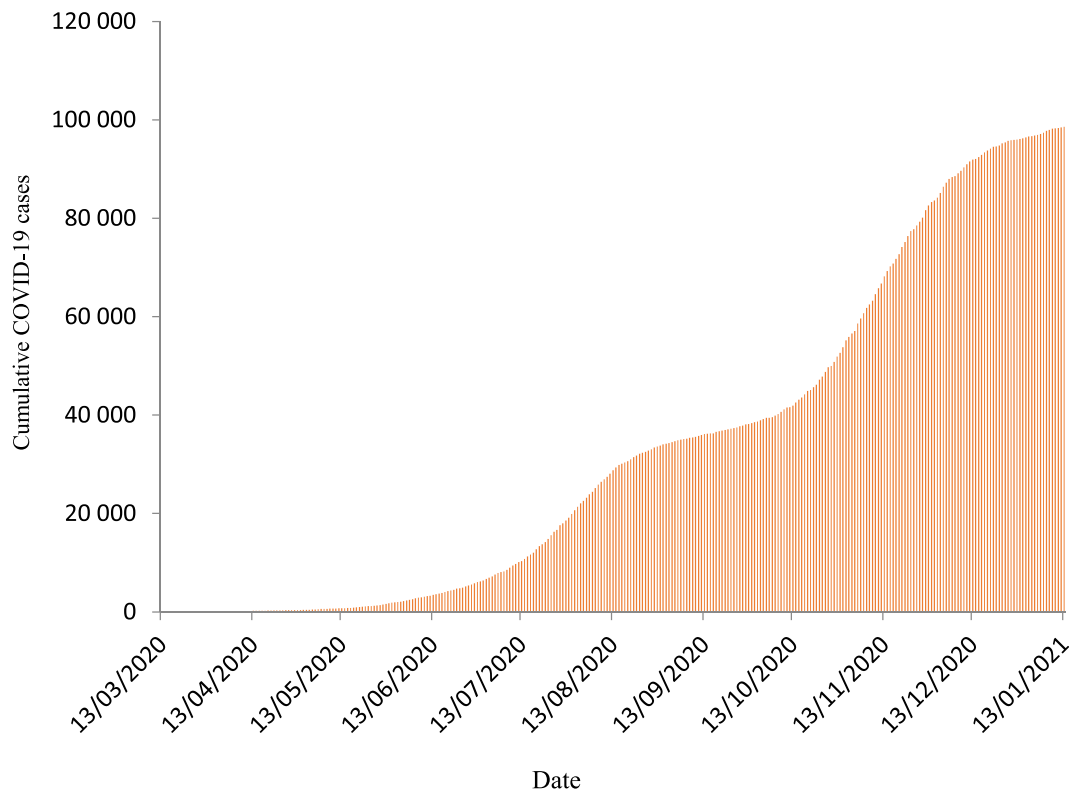* Corresponding author: inyadera@riarauniversity.ac.ke.

Fig. 1. Cumulative COVID-19 cases from March 13, 2020 to January 13, 2021 in Kenya.[2]

with the pandemic. It would be difficult to find any article, even among the glossy magazines or propaganda relics we come across on library shelves, that articulates the question of policy mismatch vs. the informal settlement within the framework of pandemics. This is partly because COVID-19, a new strand of viral infection, seems to have a unique impact on different socioeconomic and health spheres. Thus, our opinion's distinctiveness rests in its contribution towards identifying and framing appropriate questions for future research and policy designs on this subject.

2. COVID-19 epidemic in Kenya

There are over 100 urban informal settlements in Nairobi City (hereinafter referred to as "Nairobi"), the capital of Kenya. This makes it relevant to examine the questions of pandemics and policy responses. The largest informal settlement in Africa (Kibera) is also located in the city, making it highly vulnerable to a disastrous outcome if wrong policies are adopted amid a pandemic. Informal settlements in Nairobi account for over 50% of the city's total population. However, this vast population is concentrated in approximately 5% of the city's residential area. There are still many unknown underpinning factors regarding the transmissibility of SARS-CoV-2. Thus, such crowded settlements deserve more in-depth analysis. This information is crucial for predicting the course of an epidemic. A significant number of transmissions, both in community settings and via respiratory droplets, occur through human-to-human contact. As of January 13, 2021, cumulative COVID-19 cases reached 98 555 (Fig. 1) with cumulative 1720 deaths (Fig. 2) in Kenya. Further, despite the curve appearing to flatten, a combination of a low number of tests and fluctuations in daily new cases (Fig. 3) could overshadow the thought that the disease is going away.

The R_0 of SARS-CoV-2 has been estimated to be 2.2–3.11, which is significantly higher than 1, indicating that SARS-CoV-2 has a high transmissibility potential. If relevant measures are not put in place, it

Table 1
Cumulative COVID-19 cases in cities/counties of Kenya on December 5, 2020.[4]

City/County	Cumulative cases (n)	City/County	Cumulative cases (n)
Nairobi	37 530	Trans Nzoia	753
Kiambu	5 887	Lamu	220
Mombasa	7 985	Meru	936
Kajiado	2 974	Kirinyaga	401
Machakos	2 366	Kwale	320
Busia	2 479	Nandi	437
Nakuru	4 295	Siaya	474
Uasin Gishu	2 680	Kakamega	906
Migori	805	Homabay	273
Garisa	681	Isiolo	204
Kisumu	2 008	Nyandarua	354
Nyeri	967	Samburu	137
Kericho	1 478	Bungoma	724
Kitui	627	Baringo	265
Laikipia	938	Taraka Nithi	172
Narok	433	Wajir	82
Kisii	940	Vihiga	167
Kilifi	2 069	Mandera	100
Muranga	636	Nyamira	295
Turkana	846	Tana River	83
Makueni	346	Marsabit	120
Taita Taveta	435	Elgeyo Marakwet	106
Embu	507	West Pokot	157
Bomet	365		

can dramatically spread infection.[3] As of December 5, 2020, there were 96 139 cumulative COVID-19 cases in Kenya with Nairobi far ahead than the rest of the cities/counties, as shown in Table 1.

3. Challenges to policymakers and researchers

Globally, policymakers and researchers have recommended suppression and mitigation as two primary interventions to be put in place to
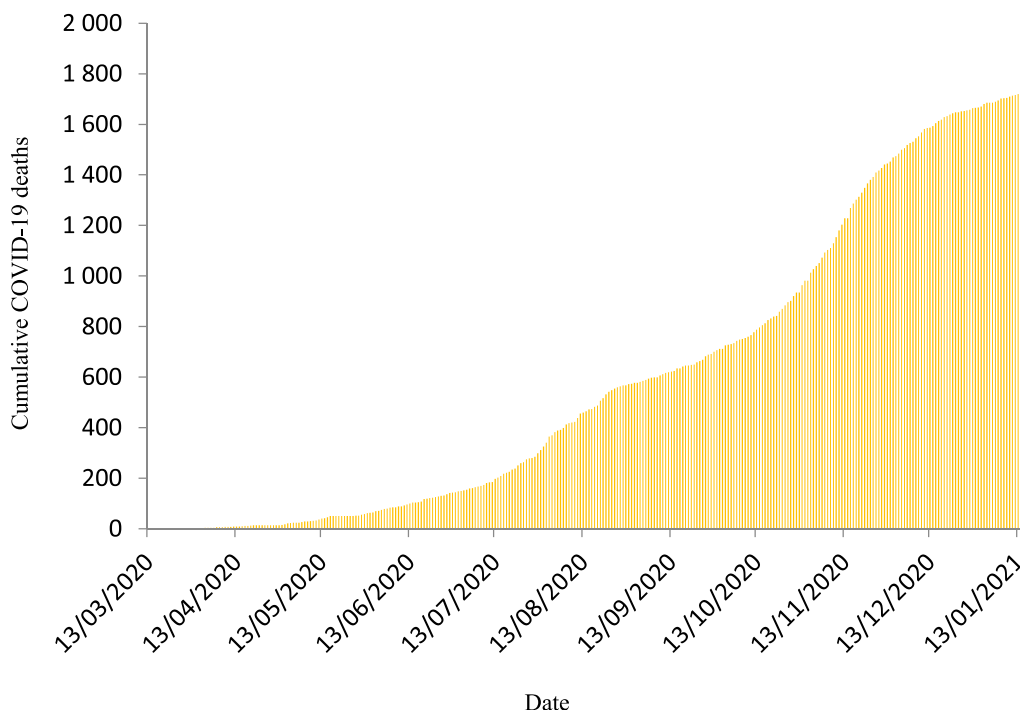
Fig. 2. Cumulative COVID-19 deaths between March 13, 2020 and January 13, 2021 in Kenya.[2]
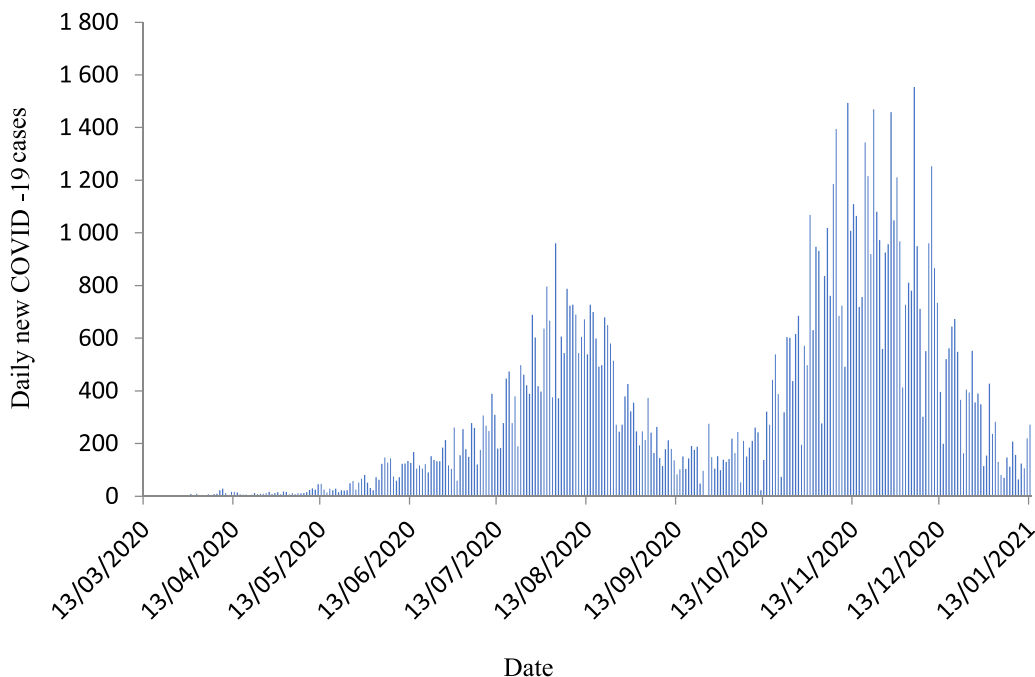

Fig. 3. Daily new COVID-19 cases between March 13, 2020 and January 13, 2021 in Kenya.[2]

control the spread of COVID-19. In suppression, governments have implemented rigorous social distancing policies to reduce the reproduction rate of the virus. The measures include closing most public spaces, staying at home, reducing commercial activities, enforcing curfews, and banning nonessential travel. In mitigation, the virus is allowed to run its natural course in a controlled manner to enable communities to develop herd immunity. In Kenya's former strategy, the population carries the risk of a second wave of the disease outbreak. Significantly, most countries with informal settlements have yet to develop policies geared

toward addressing the unique challenges faced by slum dwellers during the pandemic.

Notably, previous pandemics have shown a negative and severe impact on people living in crowded settlements. The experiences in Liberia, Guinea, and Sierra Leon during the spread of the Ebola pandemic and in Brazil, particularly the city of Rio de Janeiro (*Favelas*), during the Zika crisis, show that the housing characteristics in slum areas accelerated the spread of these diseases.[5] These findings are also echoed in a modeling study conducted during the influenza crisis in the slums of New

Delhi, India. This showed that over 44% of slum dwellers were likely to be infected with the virus irrespective of whether they were vaccinated.[6]

Kenya's strategy of containment and social distancing overlooked critical housing challenges in the slum areas of Nairobi. The majority of the houses in Nairobi slums are tiny, single-roomed units made from corrugated iron or mud often serve as the kitchen, bedroom, and sitting room for a multigenerational family. According to a survey by the African Population and Health Research Center, only 6% of the slum dwellers in Nairobi have access to clean water while 52% and 51% share toilets and sanitation facilities, respectively.[7] These houses make calls for social distancing challenging to implement as residents cannot enjoy the spatial distance. Inadequate access to water also affects the smooth implementation of policies calling for people to maintain hygiene. The tragedy for slum dwellers in Nairobi is that they are vulnerable to various forms of transmitted diseases given their houses' nature. Further, it is challenging for them to implement government policies, especially those that require adherence to spatial regulations.

4. The dilemma of the rising COVID-19 cases amid policy interventions

Like many other countries affected by COVID-19, the Kenyan government has put forward its health capacities and instituted public health strategies to prevent local transmission. Toward this end, on March 27, 2020, the government established a partial lockdown for three of the most affected counties (Mombasa, Nairobi, and Kilifi). It closed these counties' borders, suspending cultural and religious activities and shutting down schools. However, despite these policy control measures, the virus has spread rapidly, increasing infections and deaths. Researchers have recommended various predictive mathematical models to track and understand the virus's spread to formulate effective control strategies for COVID-19. Some of these models include: (1) Susceptible-Infection-Recovered (SIR) model, which describe individuals through three mutually exclusive stages of infection: susceptible, infected, and recovered; (2) Susceptible-Exposed-Infectious-Recovered (SEIR) model, which considers the post-infection incubation period in which an exposed individual is not contagious; (3) A mass-action SIR model; and an Edge-based compartmental model.[8] Several intervention strategies, such as hand washing, social distancing, quarantine, isolation, wearing of masks, and contact tracing, have been promoted as critical approaches for controlling the spread of infectious diseases. A control-oriented SIR model that stresses the effects of delays and compares the outcomes of different containment measures has also been proposed.[9] These measures are supposed to slow the spread of the viruses, keep health services from being overwhelmed, and buy sufficient time to adequately respond to the virus with the overall benefit of reducing the loss of life.

However, the existing global trends and the increasing COVID-19 cases in Kenya make one question the effectiveness of current strategies. The number of cases has quadrupled within a short period (from late June to early August of 2020) as the high transmission rate is experienced even after establishing the various plans to counter COVID-19.[10]

In light of Fig. 3, it seems the virus was not deterred by the partial lockdown, indicating the possibilities of "other" unknown intervening factors in its transmission. Again, this policy mismatch should remind policymakers and researchers that instituting massive policy without considering the contextual and behavioral factors could harm the residents more than do good. One possible factor in this pattern is the rapid urbanization of Nairobi. While the city continues to grow in population with the 2019 Census showing a growth rate of 3.88%, there is comparatively limited investment in redesigning the residential informal settlements. With this spatial condition, coupled with the epidemiological characteristics of COVID-19, it becomes clear that the city could expect the sheer scale of infection, uncontrolled hospitalization, and case-fatalities. This is because the lockdown strategy lacks diversity, promotes massification, and constraints access to already overburdened

sanitary facilities and air conditioning. Although the WHO has applied social distancing as being scientifically robust with a significant reduction in transmission of COVID-19, the socioeconomic injustices perpetrated through this strategy might be overstraining to the vulnerable population.[11]

The implementation of some COVID-19 countermeasures reveals the extent of socioeconomic and political inequalities within the country. For example, in Nairobi, the measures adopted have exposed the government's deficiencies in urban planning and failure to address informal settlement challenges. A significant portion of the city's population is finding itself contained in a small area. Further, they lack access to necessary sanitation facilities, have insufficient healthcare centres, and lack access to vital gear such as masks due to years of poor planning and neglect within this area. Moreover, with most slum dwellers depending on the informal sector, restrained movements and advice that they should work from home is a rude joke for them. This is because they rely on activities such as waste recycling, roadside vending, small-scale grocery shops, and selling second-hand clothes for their daily income.

Social injustice has been manifested not only among adults living in slums but also in children. More specifically, school-going children living in Nairobi's slums have found themselves in uncharted territory as the Ministry of Education announced that students would be studying online for the remainder of the academic term. Previous studies[12] have revealed the level of inequality among schools in Kenya with unbalanced staff, facilities, and equipment, especially in public schools, to enable them to complete their curriculum on time. However, schools' closure has left many candidates sitting for their Kenya Certificate of Secondary Education (KCSE) and Kenya Certificate of Primary Education (KCPE) examinations at a disadvantage, especially in schools that were lagging even on normal school days. However, these children are expected to sit for the same national exam. Back to the question of whether "online" classes can and would be effectively implemented in Kenya—the answer for slum dwellers would undoubtedly be "no". To successfully participate in online courses, one needs three critical assets: electricity, a computer or smartphone, and the Internet. These three facilities are difficult to come by in the slums. Still, even if one were to have access, most of the school-going children in the slums would find it difficult to get time for school work as they would be engaged in income-generating activities or other chores.

5. Key initial questions that ought to have been asked

The spread of COVID-19 from Wuhan City to the rest of the world has occurred in a short period. Therefore, the spread pattern could have allowed some countries—especially in Africa, which reported their initial cases a couple of months after the disease was detected in other parts of the world—to examine the condition and respond swiftly before arriving in their country. For starters, the most critical question is whether COVID-19, a public health crisis, would go down in history as a catastrophe. Historically, some of the worst disease outbreaks claimed the lives of nearly a third of the human population. Although the discovery of antibiotics and vaccines has reduced the risk of a global pandemic, not all infectious diseases have a vaccine or a cure. Therefore, this would mean that more proactive responses could have been enacted by examining the disease's speed and depth in other countries.

The second question would be to assess whether COVID-19 showed similar or different signs and strengths than the previous SARS and MERS. While the two did not affect people in Kenya and Africa in general, the spread of COVID-19 to countries where SARS and MERS did not spread could be a wake-up call for preventive measures in Kenya. Similarly, the case-fatality ratio question has remained ambiguous as the mortality rate is not apparent. The government of Kenya and others worldwide have benefited from information on the mortality rate in Wuhan during the early stages of the pandemic and how the government was able to contain mass infections on the mainland.

Another important question before the disease arrived in the country was whether the country's health system could shield citizens from the disease's negative impacts. Here, three essential sub-questions should be asked. First, does the government have the capacity to conduct contact tracing effectively? Once traced, are there sufficient quarantine facilities? Third, how and by whom will the cost of treatment be covered? Notably, the spread of the disease in Kenya is partly due to the collapsed contact tracing strategy, which requires many resources and sophisticated technology.

Furthermore, before adopting the lockdown and curfew policies, there was a need for advanced studies on the potential unintended consequences on people's lives. This specifically covers people living in informal settlements vulnerable to getting the disease due to the nature of their jobs and housing and who would pay a huge price from the economic lockdown given that they mostly survive on daily wages. The lack of such considerations has resulted in mounting pressure on the government to reopen the country as many low-income earners face starvation. Conversely, cases of teenage pregnancies, police brutality, mental health problems, and domestic violence have increased tremendously. Perhaps given that the number of infections continued to rise despite the strict quarantine and lockdown measures, other less painful and effective policies would have been adopted.

6. What next for policymakers and researchers?

Nairobi's current infection trend shows that counties with dense populations have some of the highest COVID-19 transmission rates, but this might reflect a generalized epidemiological trend resulting in proneness to infection rather than a causal relationship. In this opinion, we aim to shed light on identifying the right question of the effect of a public health intervention on residents' behaviors and life dynamics. We observe that the low or high transmission rates are not necessarily a result of the intervention. However, it is "other" factors that should be known to future researchers and policymakers. In framing future research questions, we recognize the extent to which policy interventions spill over to jeopardize a vulnerable population. Thus, such a research agenda must prioritize designs that allow participation of the urban informal settlements population. Therefore, we propose three research questions for future analysis of this subject: (1) geospatial analysis; (2) informal formality; and (3) fit for purpose.

First, while the lockdown significantly helped reduce international transmission of COVID-19 and hence minimized the death rate from the virus globally, the extent to which this strategy is an important preventive measure, especially in the Kenyan informal settlement, remains unknown. The extent to which social restriction matters to the transmission of pandemics in informal settlements remains largely unmeasured beyond socioeconomic implications. Geospatial analysis of geographical location time is crucial for advancing how geographical and behavioral factors can influence transmission. To the best of our knowledge, this study is the first to provide insight into the link between geography and the nature of intervention along several other dimensions: (1) the analysis would have to encompass the entire country; (2) the researchers would quantify the risks along with variables such as gender and age; (3) boundaries in space and time would have to be restricted concerning risk levels of the target population; and (4) the number of infections and death rates would be compared between residents in the informal settlement and those living in well-planned settlements and rural areas.

The second question concerns the "formality of informality" in the context of a pandemic. COVID-19 has magnified the existing fault lines in the socioeconomic systems of the country. The policy mismatch phenomenon during the COVID-19 pandemic implies that the residents of informal settlements in Nairobi, mainly in Kibera, Mathare, Korokocho, Mukuru, Soweto, and Kawangware, continue to suffer poor planning, inadequate health facilities, lack of proper housing and sanitation, and

insufficient water and electricity. The blanket policies characterized by curfews, partial lockdown, and "social distancing" that the government of Kenya has adopted appear to push residents further to the risks of contracting the disease. This social dimension of health presents an interesting conundrum and potential lacuna for policy research. Current research seems to evade concern on how informal activities and assets of informal settlements could be harnessed into meaningful strategies for effective public health intervention.

Finally, to what extent are government policies suitable for purposes? In Nairobi, slum houses do not offer any comfort to their inhabitants, who are compelled by the partial lockdown to spend more time in crowded single-room, low-quality shanties. Several people are forced to share run-down residences even with overflowing toilets and bathrooms while children have to play in a polluted environment. As mentioned above, despite all the restrictive social measures imposed during COVID-19, the number of infected cases in the country steadily increased, begging the question as to whether these measures are effective. Crammed in the tiny homes are also multigenerational family members, which poses a serious threat to vulnerable populations: children, women, and older citizens. Policy mismatches are not limited to essential assets. Outdoor infrastructure can be instrumental in minimizing casualties in times of disaster. However, there is a lack of accurate data on the slum residents and unrestricted entry and exit in these areas. Surveillance, a centerpiece for countries such as China and Korea in flattening the COVID-19 curve through contact tracing, would be nearly impossible to attain in Nairobi slums should the disease break out. Vital concerns will have to be addressed in issues such as: (1) the vulnerability of casual laborers without health insurance coverage or pension; (2) the risks to the self-employed engaged in low-paying activities such as waste collection, recycling, and street vending; (3) the additional losses inflicted by the pandemic on their already meager incomes and their crowded neighborhoods that make them even more vulnerable to getting the disease; (4) the lack of the necessary social safety nets to access proper medication and the potential loss of life; and (5) ways of ensuring that the research design is responsive to the affected population.

Beyond the above critical questions, other questions can be raised as the disease continues to spread. These include what options other countries have faced amid the pandemic and what the outcome was of adopting some of the policies. This will help countries that have not reached the peak of the disease in response to informed experiences. Specifically, it is worth reflecting on the uncertainties and apparent problems experienced by different countries in response to the virus. Second, given the disease's trend, is there room for optimism, and, if so, from where can such optimism be derived? Third, and most importantly, could this pandemic have been stopped by science? What about international organizations, such as WHO could have done it better? Has COVID-19 had any scientific surprises? How best can the government cushion the informal sector when reopening the country? How can we best respond to future pandemics? If addressed, these questions could contribute to more effective responses, especially by governments with weak public health systems and large informal settlements.

7. Conclusion

Our thinking of future research and policy agendas on this subject was motivated by the limited attention that public health intervention's potential negative impacts have received in the current COVID-19 crises. Because of this inattention, very little data exist on policy analysis. As mentioned previously, this virus is first transmitted through human beings. Increased investment in researching pandemic-related policies, strategies, and interventions by governments and public health systems would help accumulate scientific evidence leading to the formulation of effective policies for handling future pandemics.

CRediT author statement

Israel Nyaburi Nyadera: Conceptualization, Writing—Original Draft. **Francis Onditi**: Conceptualization, Writing—Review & Editing, Data Curation. **Moses Madadi Obimbo**: Conceptualization, Writing—Review & Editing. **Samson Kinyanjui Muchina**: Conceptualization, Writing—Review & Editing.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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