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Mitigation strategies in early phase of COVID-19 pandemic and recovery potential in Nigeria and United States

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Abstract

Background: In response to the ongoing coronavirus disease 2019 (COVID-19) pandemic, much uncertainty exists in low- and middle-income countries like Nigeria about the effects of different mitigation strategies on the trajectory and impact of the disease transmission given how high-income countries like the United States (US) with even better infrastructures have been impacted. Further uncertainty stems particularly from the significant challenges in a country's health system, economy and food security prior to the emergence of the pandemic. The objective of this study was to compare the physical and psychosocial mitigation strategies during early phase of COVID-19 pandemic and recovery potential in Nigeria and US.

Methods: We performed a secondary data review of relevant studies and reports searched on PubMed, Google Scholar and Google databases. Data were analyzed using content analysis and grounded theory methods.

Results: We showed that the implementation of biomedical mitigation strategies during COVID-19 pandemic lockdown without physical and psychosocial mitigation strategies such as food supply and financial incentive puts Nigeria at risk of further crises while the US, though on the path of a long-term recovery, faced similar risk as well from protests despite availability of food and financial supports.

Conclusion: The lack of food supply and financial incentive during COVID-19 pandemic lockdown in Nigeria, and associated negative impact on recovery highlight the need for provision of social welfare packages for its citizens to mitigate the physical and psychosocial effects of the COVID-19 pandemic (e.g. violence). Evidence of protests in the US warrants intensified risk communication interventions.

Keywords: *COVID-19, mitigation, community wellness, recovery.*

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Résumé

Contexte: En réponse à la pandémie de coronavirus en cours de 2019 (COVID-19), une grande incertitude existe dans les pays à revenu faible et intermédiaire comme le Nigéria quant aux effets des différentes stratégies d'atténuation sur la trajectoire et l'impact de la transmission de la maladie compte tenu de la des pays à revenu comme les États-Unis (États-Unis) dotés d'infrastructures encore meilleures ont été touchés. L'incertitude supplémentaire découle en particulier des défis importants du système de santé, de l'économie et de la sécurité alimentaire d'un pays avant l'émergence de la pandémie. L'objectif de cette étude était de comparer les stratégies d'atténuation physiques et psychosociales au cours de la phase précoce de la pandémie de COVID-19 et le potentiel de rétablissement au Nigéria et aux États-Unis.

Méthodes: Nous avons effectué un examen des données secondaires des études et des rapports pertinents recherchés dans les bases de données PubMed, Google Scholar et Google. Les données ont été analysées à l'aide d'une analyse de contenu et de méthodes théoriques fondées.

Résultats: Nous avons montré que la mise en œuvre de stratégies d'atténuation biomédicale pendant le verrouillage de la pandémie COVID-19 sans stratégies d'atténuation physique et psychosociale telles que l'approvisionnement alimentaire et les incitations financières met le Nigéria en danger de nouvelles crises tandis que les États-Unis, bien que sur la voie d'un long terme la reprise, a également fait face à un risque similaire à cause des manifestations malgré la disponibilité de la nourriture et des aides financières.

Conclusion: Le manque d'approvisionnement alimentaire et d'incitation financière pendant le verrouillage de la pandémie de COVID-19 au Nigéria, et l'impact négatif associé sur le rétablissement mettent en évidence la nécessité de fournir des programmes de protection sociale pour ses citoyens afin d'atténuer les effets physiques et psychosociaux de la pandémie de COVID-19 (ex. violence). Les preuves de manifestations aux États-Unis justifient une intensification des interventions de communication des risques.

Mots clés: *COVID-19, atténuation, bien-être communautaire, rétablissement.*

Introduction

The human existence has been threatened by pandemics such as plagues, small pox and the ongoing coronavirus disease 2019 (COVID-19) outbreak [1]. The COVID-19 outbreak was first reported in Wuhan, China on December 31, 2019. Prior to its emergence, some parts of the world were equally hit by other coronaviruses namely Severe Acute Respiratory Syndrome (SARS) and Middle East respiratory syndrome (MERS) [2,3]. Following the World Health Organization (WHO)'s declaration of the outbreak as a pandemic on March 11, 2020, the number of cases and deaths worldwide has been on the increase, with different countries disproportionately affected [4]. As of April 8, 2020, a total of 1,353,361 COVID-19 cases including 79,235 deaths had been reported globally with the case-fatality rate being 5.8%, which is lower than 10% and 36% reported for SARS and MERS respectively [3,5]. Evidence so far indicates that COVID-19 virus infects humans of all ages but the risk of the disease severity is higher among elderly and people with pre-existing health conditions such as heart diseases and diabetes [4].

Globally, COVID-19 just like other pandemics has posed serious health, economic and socio-political challenges [6-9]. While this pandemic burden varies within and between regions, it is unclear why high-income countries with advanced technology and better health system like the US, had recorded higher cases of COVID-19 infection and death while low- and middle-income countries (LMICs) like Nigeria with poorer infrastructures had low figures [5,10-11]. Though, a study observed that Nigeria and other LMICs were at higher risk of impact, but this has been to the contrary, even though many factors could have contributed to this outcome [12]. Several biomedical mitigation strategies such as social distancing, hand hygiene and quarantine have been shown to be effective in curbing the spread of the infectious agents implicated in previous pandemics [3]. However, there is scarcity of data on physical and psychosocial mitigation strategies for pandemics. Hence, we attempted to primarily compare the physical and psychosocial mitigation strategies during early phase of COVID-19 pandemic and their implications on recovery or further crises outcomes in Nigeria and US.

Rationale for Nigeria and US Comparison

The rationale for this study was to gain insight into the mitigation strategies towards COVID-19 pandemic in LMICs like Nigeria, with weak health systems compared to advanced economies with better health systems to draw lessons for policy and practice implications. Hence, the US was randomly selected by balloting among the advanced economies including France, Germany, Canada, Italy, United Kingdom, Japan and Russia.

Relevance of study

Previous studies on this subject matter only focused on biomedical strategies to mitigating the spread of COVID-19 virus and also the health impact of the pandemic [6, 13] and did not assess the physical and psychosocial factors that could potentially influence the further spread of COVID-19 virus and recovery potential from the pandemic.

Conceptual clarification and frameworks

Community Wellness: is defined as "the optimal state of health of individuals and groups" according to WHO". Hence, community wellness is said to be achieved when the health of individuals in a particular geographical location is optimal and they are also able to fulfill their roles in the society [14].

Food security: Based on World Food Summit definition, food security "is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" [15]. Food insecurity is "transitory" when there is a sudden drop in the ability to secure food due to unusual circumstances e.g. pandemic, variation in food prices etc. [16].

Health system

According to WHO consist of "all organizations, people and actions whose primary intent is to promote, restore or maintain health". For a health system to achieve its goals, it has to carry out some basic functions which have been identified as "the six building blocks of a health system" namely health service delivery; health workforce; health information system; medical products, vaccines and technologies; health financing and leadership/governance [17].

Economic stability

Denotes a situation where a nation's financial system manifests only a slight fluctuation in output growth and consist of inbuilt mechanism to maintain inflation rate at a low level. Output growth is usually measured among other indices by the gross domestic product (GDP) and employment [18].

Disaster recovery: is one of the phases of the disaster management cycle. Disaster recovery is "an opportunity for reflecting on the root causes of a disaster and recasting development priorities to

reduce human vulnerability to natural hazards". In effect, the aim according to WHO is "re-establishing the economic, social and cultural life of the people affected and to rebuild damaged areas" [19].

Based on understanding from the "syndemic model of health" which describes how social and environmental factors interact synergistically with diseases to promote their transmission and unfavourable health outcomes, [20] the impact of the above concepts on COVID-19 pandemic is shown in fig 1.

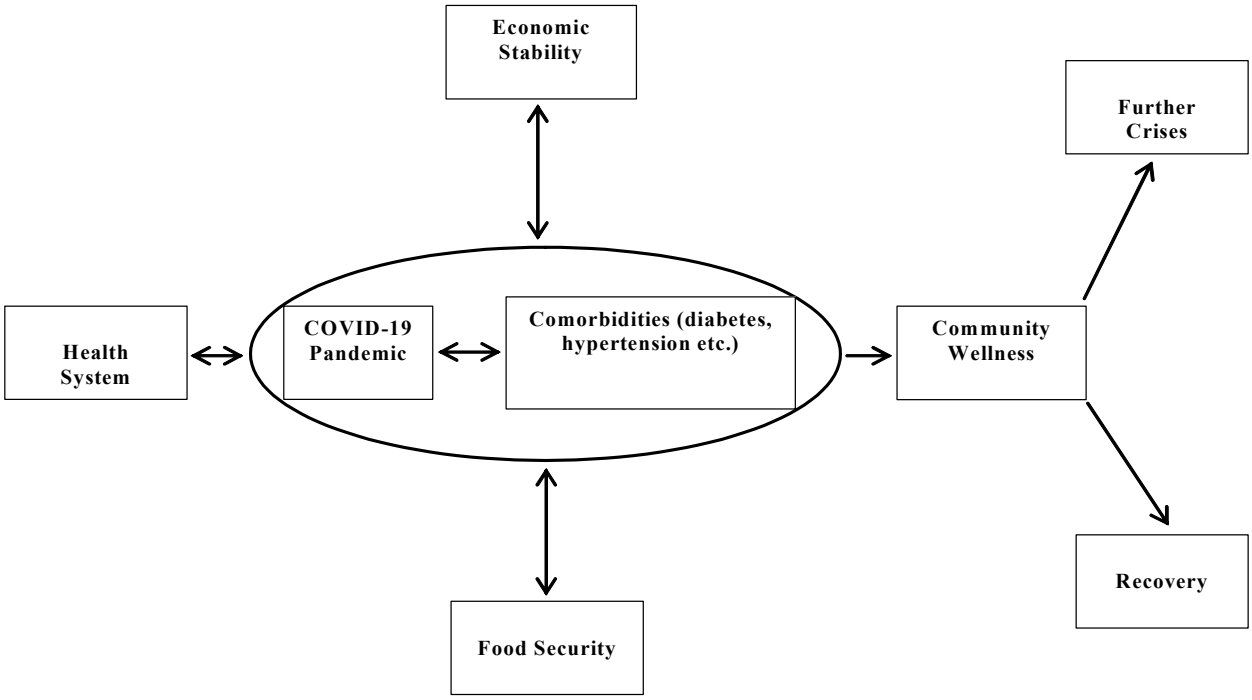

Figure 1: Syndemic model of health for COVID-19 pandemic

In addition, we used an adapted framework of Interagency Working Group on Behavioural Health and Pandemic Influenza as shown in fig 2 to describe the potential psychosocial consequences of a pandemic [21]. The concept described in this framework is consistent with the findings of studies specific to the past SARS outbreak and the ongoing COVID-19 pandemic [22-24].

Frameworks description

Fig 1 showed the biosocial complex of interactions with COVID-19 pandemic. At the biological level, COVID-19 virus adversely interacts with comorbidities such as diabetes and hypertension within populations. This biological interaction is further influenced synergistically by social factors including the status of the health system, economic stability and food security which may result in either reduced transmission of COVID-19 virus and positive health, and psychosocial outcomes that facilitate recovery or increased disease progression and negative outcomes that favour further crises.

Fig 2 described the cause-effects associations due to COVID-19 pandemic and the mitigation strategies. The interplay of the triad; reactionary distress, mental disorders and personal behaviours, in individuals to a large extent determines the state of community wellness, which in this pandemic situation is perceived to be negative. However, other factors such as individual resilience, cultural norms, politics as well as religion may singly or collectively impact the state of community wellness.

Methodology

Study design and procedure

We conducted a qualitative review of secondary data sources inclusive of journals, news items, WHO situation reports and data from public agencies. Using content analysis and grounded theories methodologies, we then performed a comparative analysis of the outcome variables in Nigeria and US. The outcome variables analyzed included biomedical containment/ mitigation strategies, physical/psychosocial mitigation strategies on COVID-19 pandemic and effects of

mitigation strategies on recovery. Only journal articles

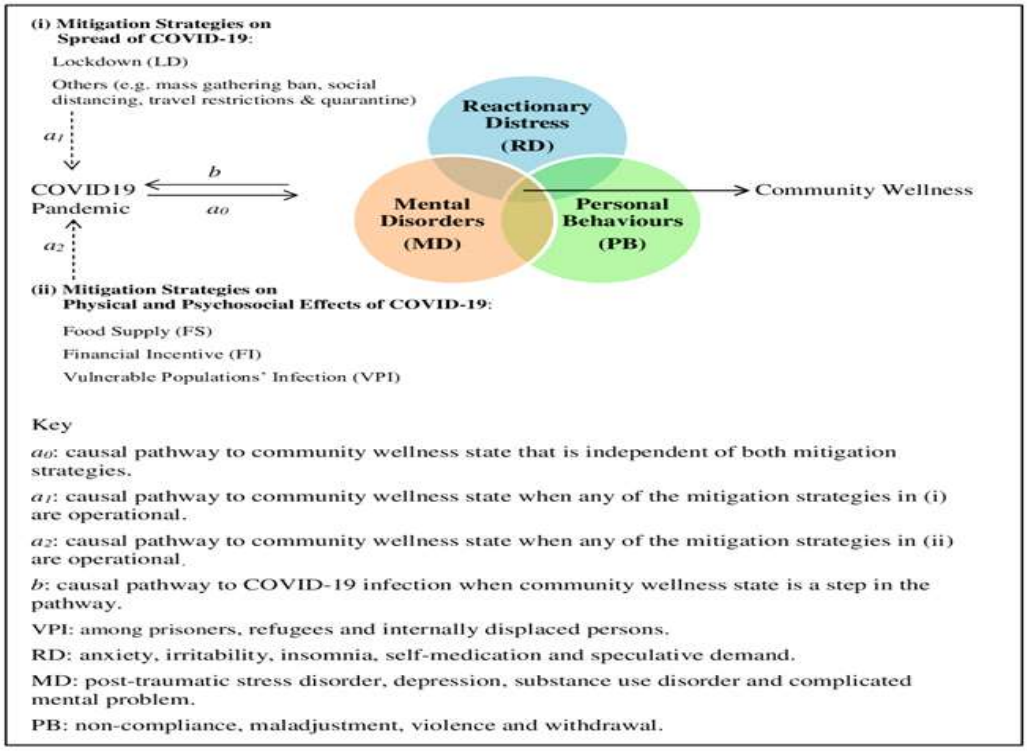

Fig. 2: Mitigation and community wellness framework for COVID-19 pandemic

information were collected using Google scholar and PubMed databases while other data were searched on Google. Data search were conducted between April 5-23, 2020, and only one journal article that is specific to mitigation strategies on COVID-19 pandemic was found [13]. The article provided a review of community mitigation strategies in a pandemic (e.g. termination of mass events, social distancing, travel restrictions, home quarantine, and clear communication of health information) that could be implemented by communities and countries to lessen the transmission of COVID-19 virus. Search words included "COVID-19", "Coronavirus 2019", "2019-nCov", "COVID-19 and mitigation strategies", "COVID-19 and recovery", "food insecurity", "health system", "economic instability", "disaster recovery", "pandemic and health system", "pandemic and food insecurity", "pandemic and economic instability" with country ("Nigeria" or "US"). Only reputable local news sources (e.g. were first provided in the Google search list were included for the review.

Study setting

Nigeria, according to United Nations (UN, 2019) has a population of 200,964,000 while the US has 329,065,000. The same source provided that the life expectancy at birth of a Nigerian is 54 years while that of US is 79 years. The percentage of population who are 65 years and above in Nigeria and US are 3% and 16% respectively [25]. The unemployment rate in Nigeria as at 2019 was 19.6%. The US unemployment rate was 3.5% within the same period prior to COVID-19 pandemic. As at March 2020, with the COVID-19 pandemic, the unemployment rate for Nigeria was unavailable but the projected rate was 33.5% for the year 2020. The US unemployment rate the same year was 4.4% as at first quarter [26-28]. As at April 8, 2020, the total

number of COVID-19 cases in Nigeria was 276 with 6 deaths. In the US, it was 401,166 cases with 12,936 deaths [29-30]. The Nigeria Centre for Disease Control (NCDC) is the lead agency working in collaboration with other agencies such as Federal Ministry of Health, Office of the National Security Adviser among others to contain and mitigate the spread and effects of COVID-19 [31]. As for the US, the principal agency is the Centres for Disease Control (CDC), while the other agencies include but not limited to The Food and Drug Administration and National Institute of Health [32]. The biomedical mitigation strategies instituted by the NCDC and CDC include hand hygiene, face mask use, quarantine, social distancing, mass gathering ban, school closure and lockdown.

Results

Overview of Biomedical Containment and Mitigation Strategies

The implementation of containment strategies such as travel restriction was delayed in both Nigeria and US. This was evident in the time lag between the index imported case of COVID-19 (February 27, 2020 in Nigeria and January 21, 2020 in US) and the enforcement of travel restriction on high risk countries including China (March 21, 2020 in Nigeria and March 13, 2020 in US) which resulted in higher number of imported cases in both countries [33-39]. The banning of mass gatherings and schools closure mitigation strategies was implemented late in Nigeria compared to the US. In Nigeria, this ban policy took effect on March 18, 2020 which was 1 week after COVID-19 was declared a pandemic while that of the US was same day of the declaration. The lockdown mitigation strategy was found to be implemented late in Nigeria compared to the US. The lockdown was effected on March 29, 2020 in Nigeria, about three weeks after the pandemic declaration while that of the US was on March 21, 2020, about 2 weeks post-pandemic declaration [40-41].

Physical and Psychosocial Mitigation Strategies

Food supply during the COVID-19 pandemic lockdown was found to be inconsistent in Nigeria while this does not appear to be so in the US [42-43]. Evidence showed that the financial incentive package in Nigeria had a less comprehensive allocation plan and lacked specificity of individual income compared to the US which had a robust plan and stated a sum of $2,000 per capita [45-46]. Data on the control of COVID-19 among the vulnerable populations (i.e. prisoners, refugees and internally displaced persons) in Nigeria and the US were unavailable at the time of this review.

Effects of Mitigation Strategies on Recovery

The effect of mitigation strategies on recovery was analyzed using a proposed framework in fig 3, which predicted the state of community wellness and the potential for recovery or further crises considering different scenarios of mitigation strategies. In this analysis, Nigeria and the US were found to be at risk of further crises rather than recovery from the COVID-19 pandemic.

Fig 3 showed the cause-effect associations of both $a_{1\text{-}2}$ and b in multiple mitigation scenarios. With specific reference to scenario 1, it is apparent that both countries do not fit into short-term recovery. This is on account of lack of food supply, lack or inadequate financial incentive and possible presence of vulnerable populations' infection in Nigeria, and the risk of vulnerable populations' infection in the US despite food supply and financial incentive [42-46]. The goal of scenario 2 is long-term recovery, we observed that US was supposed to fit into this pathway but the expected compliance to lockdown was breached which may pose further danger while this is not applicable to Nigeria [42-46,48]. The primary outcome of scenario 3 is further crises, we projected that Nigeria fits into this pathway because of the peculiarities of physical and psychosocial mitigation strategies described above and the ongoing protest arising from poor social welfare while the US appears to be at risk as well because of its citizens' protest for unclear motive [42-46,48-49].

Discussion

Biomedical containment and mitigation strategies to prevent or slow the progression and effects of pandemics are crucial for favourable outcomes such as recovery in a population. In this review, we found a delay in travel restriction after index imported cases in Nigeria and US. This delay could have been because COVID-19 had not been declared a pandemic at the time both countries had their index imported cases. Concerning mass gatherings ban, schools closure and lockdown during COVID-19 pandemic, we found that Nigeria implemented these policies late compared to the US. The difference in this implementation timelines could be attributed to the varying threshold definitions in terms of COVID-19 cases and deaths for such mitigation strategies in both countries. Additionally, this could be as a result of variance in socio-economic and political contexts in both countries.

Regarding physical and psychosocial mitigation strategies, food supply during COVID-19

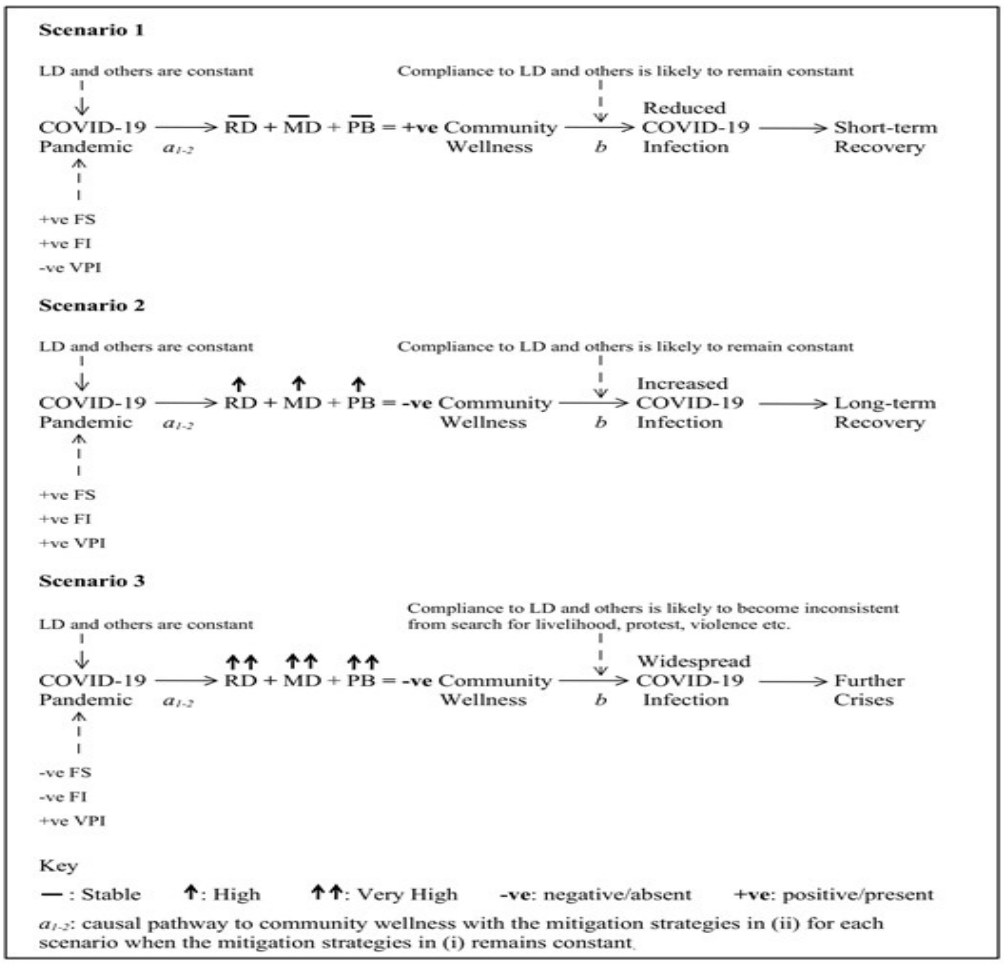

Fig. 3: Effects of mitigation strategies on recovery in COVID-19 pandemic

pandemic lockdown to mitigate potential transitory food insecurity at household and national levels was found to be inadequate in Nigeria compared to the US. This difference could be due to the state of food security in both countries prior to the pandemic where Nigeria was found to be food insecure with 5-14.9% hunger index while the US has a reasonable level of food security with less than 2.5% hunger index [44]. About financial incentives to mitigate possible economic contractions due to the COVID-19 pandemic and the lockdown, we found that although both countries had financial incentive packages, Nigeria lacked a comprehensive and specific allocation plan compared to the US. This deficiency in the comprehensiveness of the financial incentives might be because of the difference in economic stability status (i.e. in terms of per capita GDP) in both countries during the COVID-19 pandemic.

Our submission is corroborated with a data that showed that Nigeria had a 50% fall in per capita GDP ($2,407 to $1,181) compared to a 30% drop ($67,063 to $20,289) in the US [47]. One reason for the non-specificity of the financial incentive per individual in Nigeria might be attributed to the idea of government trying to avoid being held accountable on the disbursement of the budgeted funds. Despite lack of data on the control of COVID-19 among the vulnerable populations such as prisoners in Nigeria and US during the time of this review, we posit that given the increased risk of transmissibility of the disease due to overcrowding, poor health facilities, epileptic water supply and sanitation challenges in

their facilities, a decongestion policy is warranted in both countries.

Concerning the effects of the identified mitigation strategies on recovery from COVID-19 pandemic, our assumption that both Nigeria and the US are at risk of further crises, especially Nigeria, calls for urgent evidence-based interventions to reverse this unfavourable outcome.

Limitations of study

Results in this study are subject to some limitations. First, because COVID-19 is an evolving area of study, there was dearth of journal articles particularly tailored to our study objectives which informed other data sources such as news items and other online resources that could have limited the precision of this study results. Second, there was potential for information bias especially from the news data due to its subjective nature and biases from the authors and/or publishers. Third, due to unavailability of data that modeled the effects of lockdown in association with food supply, financial incentive and vulnerable populations' infection on the trajectory of disease transmission in pandemics, the assumptions in fig 3 were based on plausible reasoning. Fourth, the frameworks analyses but only showed associations and could not prove causality of factors. Fifth, the frameworks did not take into account other factors (e.g. individual resilience, cultural norms and politics) that may have influenced the state of community wellness in a pandemic situation as evident by the non-conformation of US to scenario 2 despite meeting all its requirements, hence creating the potential for a confounding bias. Nonetheless, our study still provided social insights for advancing the modeling methodologies for public health policy and practice implications during pandemic situations.

Conclusion

The lack of food supply and financial incentive during COVID-19 pandemic lockdown in Nigeria, and associated negative impact on recovery highlight the need for provision of social welfare programs for its citizens to mitigate the physical and psychosocial effects of the COVID-19 pandemic such as violence. The evidence of mass gathering from protests in the US despite availability of social welfare programs warrants intensified risk communication by the public health and government leaders. Both Nigerian and the US governments should use evidence-informed approach to support vulnerable populations as well.

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