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Nutrition-sensitive lockdowns: Conceptual framework and empirical insights from Africa during COVID-19

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Summary

Motivation: Countries facing challenges of nutrition security confront a trade-off when dealing with pandemics such as COVID-19. Implementing lockdown measures, widely used worldwide, can help "flatten the curve" (of disease), but such measures may worsen nutrition security.

Purpose: We aim to identify and justify nutrition-sensitive lockdown measures to reduce trade-offs with nutrition security.

Methods and approach: We propose a conceptual framework which distinguishes eight lockdown measures and six pathways to nutrition security. To demonstrate the relevance of the pathways, we reviewed emerging literature on COVID-19 and nutrition security. We analysed the content of 1188 newspaper articles on lockdown effects in five African countries: Benin, Ghana, Kenya, Uganda and Zambia.

Findings: Some lockdown measures, such as closing workplaces and restricting movement, potentially worsen nutrition far more than others. Banning events and public gatherings have far less impact on nutrition. This can be

seen from the framework, the academic literature, and is supported by the analysis of newspaper reports in the five countries.

Policy implications: It is better, when possible, to test and trace disease than to lock down. But when lockdowns are needed, the first recourse should be to measures that have few nutritional consequences, such as banning public events. When more drastic measures are necessary, nutritional harm should be mitigated by, for example, exempting farm labour from restrictions on movement, by replacing school meals with take-home rations, and, above all, providing income support to the most affected and most vulnerable households.

KEYWORDS
Africa, Covid-19, flatten-the-curve, food security, lockdown policies, nutrition

1 | INTRODUCTION

Confronted with COVID-19, governments across the world enacted lockdown policies to reduce contact between people. Lockdowns can comprise a variety of measures ranging from banning public events to workplace closures and stay-at-home orders (Hale et al., 2020; Hsiang et al., 2020). Lockdowns have been effective in slowing the contagion of the virus, preventing many deaths directly attributable to the virus (Hsiang et al., 2020; Lau et al., 2020), but they caused severe social and economic effects, which in turn have affected global health. The World Bank estimated that 97 million additional people fell into extreme poverty in 2020 (Mahler et al., 2021). The State of Food Security and Nutrition in the World annual report for 2020 (FAO et al., 2020) estimated that between 80 million and 130 million people became undernourished because of COVID-19 lockdowns and the associated global recession. While there are no global numbers, the emerging evidence indicates the significant effects of lockdowns not only on hunger but also on hidden hunger (micronutrient deficiencies) (Abay et al. 2020; Fore et al., 2020; Jaacks et al., 2021; Jafri et al., 2021; Kansiime et al., 2020; Sharma et al., 2020).

There is an emerging empirical literature on the overall effects of COVID-19 and the responses to the pandemic on nutrition security. Lockdowns have affected job opportunities, thus reducing household income and food consumption, even where food is available, as well as causing some supply chain disruptions (Abay et al., 2020; Adjognon et al., 2020; Amare et al., 2021; Jaacks et al., 2021; Kansiime et al., 2020; Mahmud & Riley, 2021). Lockdowns particularly affected poor urban households, which spend up to 70% of their income on food (Adjognon et al., 2020; Arndt et al., 2020; Laborde et al., 2020). Reduced food quantity particularly affects children. Headey et al. (2020) estimate that the pandemic caused a 14% rise in the prevalence of moderate or severe wasting among children. Roberton et al. (2020) estimate an increase of between 18% and 23% in child mortality.

Lockdowns also reduced access to, for example, micronutrients by affecting the consumption of fruits and vegetables and livestock products in low-income countries such as Ethiopia, Kenya, and South Africa (Abay et al., 2020; Kansiime et al., 2020) and among poor households in high-income countries such as the USA (Sharma et al., 2020).[1]

[1]In some population groups and world regions, lockdown policies also contributed to overweight by causing shifts to less healthy diets and lower physical activity levels (Poelman et al., 2021; Robinson et al., 2021).

A lack of micronutrients is particularly harmful to vulnerable population groups, such as children. In the short term, it affects the immune system, which explains, among other things, the sharp increase in respiratory diseases in children during the pandemic (Sinha et al., 2020). In the long term, in particular for children during the 1000-day window from conception, it can cause irreversible effects on physical and cognitive development (Biesalski, 2017; Leddy et al., 2020). While disruptions to the access to calories typically become visible, e.g., in the form of empty food shelves and food riots during the food price crisis of 2007–2008 (Berazneva & Lee, 2013), and are likely to be corrected in democratic countries (Sen, 1981), the effects on the access to micronutrients are typically hidden and are, therefore, more likely to remain unaddressed.

The emerging literature quoted above has established important effects of the overall responses to COVID-19 on nutrition security. However, none of the studies has, so far, systematically disentangled the effects of different lockdown measures on nutrition security. This is important because lockdown policies comprise a wide variety of measures, ranging from stay-at-home orders to the closure of international borders. Such diverse measures may affect nutrition security in different ways and to different extents. To address this knowledge gap, this article develops a conceptual framework that can be used to examine how different lockdown measures affect different dimensions of nutrition security. The framework identifies potential pathways, by which different lockdown measures affect nutrition security. On this basis, "nutrition-sensitive lockdown policies" can be identified, which are effective from an epidemiological perspective but counter the negative trade-offs with nutrition security.

To assess the relevance of the pathways identified in the conceptual framework, we draw on two types of empirical evidence. First, drawing on statistical data on pre-COVID-19 nutrition security and COVID-19 lockdown stringencies, we explore whether more food-insecure countries implemented different lockdown measures as compared to more food-secure countries. Second, we draw on a content analysis of 1188 newspaper articles on lockdown effects that were published by major newspapers in five African countries: Zambia, Benin, Ghana, Uganda, and Kenya. The evidence from newspaper articles has to be interpreted carefully. Newspaper articles may not show the actual situation and nutrition security of a country, as they may be influenced by the degree of political freedom. As such, newspaper articles cannot replace evidence from scientific research. However, only a few thorough empirical studies could be conducted in developing countries *during* the first wave of lockdown measures. Such phone-based studies provide very valuable insights on nutrition security, but also have limitations (Hirvonen et al., 2021). Most importantly, these studies focused on nutrition security effects rather than the underlying mechanisms causing them. Therefore, newspaper articles appear as useful to assess the relevance of our conceptual framework, as they provide unique and real-time insights into the different ways that different lockdown measures have affected different dimensions of nutrition security.

As further detailed in the empirical methods section, the five case study countries were chosen to cover different levels of nutrition security at the onset of the pandemic, different types of political regimes, and different combinations and stringencies of lockdown measures.

Section 2 introduces our framework. Section 3 introduces the five case study countries and presents the methods used to understand the stringency of lockdown measures (see subsection 3.1.) and the effects of lockdown, namely the media analysis (see subsection 3.2.). Section 4 presents evidence from statistical data and newspaper articles. Section 5 discusses policy implications.

2 | FRAMEWORK

Table 1 presents the framework that was developed to identify potential pathways, by which different lockdown measures influence nutrition security. To differentiate the lockdown measures, we use the classification of the Oxford COVID-19 Government Response Tracker, which distinguishes eight types of lockdown measure (Hale et al., 2020), as shown in Table 1. To identify the pathways by which these measures may affect nutrition security, we draw on Devereux et al. (2020), who conceptualize potential impact pathways by combining three different frameworks: the Food and Agriculture Organization of the United Nations' (FAO) "four pillars" framework of food security, which

TABLE 1 Potential effects of COVID-19 lockdown measures on nutrition security

	Dimensions of nutrition security / Pathways of impact on nutrition security						
	Availability		Access				Total dimensions of nutrition security affected
Lockdown measures	Upstream: Agricultural production	Downstream: Processing, sales, and trade	Economic access	Physical access	Transfers	Utilization	
(1) Workplace closing	Limited *(if agriculture is exempted)*	Limited *(if food-related activities are exempted)*	Strong *(can affect incomes and savings/assets)*	Limited	Strong *(can affect private transfers)*	Strong *(loss of access can affect diets)*	3/6
(2) Close public transport	Strong *(can affect labour)*	Strong *(can affect labour)*	Strong *(can affect incomes and savings/assets)*	Strong *(can affect access to markets)*	Strong *(can affect private/public transfers)*	Strong *(can affect diets and access to health care)*	5/6
(3) Restrictions on internal movement	Strong *(unless agricultural labourers can be exempted)*	Strong *(unless agricultural labourers can be exempted)*	Strong *(can affect incomes and savings/assets)*	Strong *(can affect access to markets)*	Strong *(can affect private/public transfers)*	Strong *(can affect diets and access to health care)*	6/6
(4) Stay-at-home requirements	Strong *(unless agricultural labourers can be exempted)*	Strong *(unless agricultural labourers can be exempted)*	Strong *(can affect incomes and savings/assets)*	Strong *(can affect access to markets)*	Strong *(can affect private/public transfers)*	Strong *(can affect diets and access to health care)*	6/6
(5) Restrictions on private gathering	Limited	Limited	Limited	Limited	Strong *(can affect private transfers)*	Limited	1/6
(6) School closure	Limited	Limited	Limited *(but long-term effects on physical and mental development possible)*	Limited	Strong *(can affect school feeding programmes, but such effects can be avoided)*	Strong *(can affect diets)*	2/6
(7) Cancel public events	Limited	Limited	Limited	Limited	Limited	Limited	0/6
(8) Restrictions international movement	Limited	Limited	Limited	Limited	Limited	Limited	0/6
Lockdown measures affecting nutrition security dimension	3/8	3/8	4/8	3/8	5/8	5/8	

Source: Authors.

distinguishes food availability, access, utilization, and stability (FAO, 2008); the food systems approach proposed by the UN Committee on World Food Security (HLPE, 2017); and Amartya Sen's (1981) entitlement approach.

FAO's four-pillar approach is useful to disentangle which dimension(s) of nutrition security a specific lockdown measure is likely to influence: (1) availability; (2) economic, social, and physical access; (3) utilization; and/or (4) the stability of the first three pillars over time (FAO, 2008). To assess the impact of different lockdown measures in more detail, it appears useful to split food availability into two categories: (1) agricultural production, which depends on the access to inputs such as fertilizer and labour as well as services such as finance, extension services, and veterinarians; and (2) food processing, sales, and international and national trade. Separating the upstream and downstream agri-food value chain helps provide a better understanding of entry points for supply disruptions, an aspect that is emphasized in food systems thinking (Devereux et al., 2020; Harris et al., 2020). Concerning FAO's access dimension, it appears useful to differentiate between economic access to food, which depends on the income and the price of food as well as savings and assets, and physical access to food, which depends on the food environment and market infrastructure. As shown by Sen (1981), access to food can also be based on "transfer entitlements," which can be private (e.g., remittances or food donations) or public (e.g., public cash transfers and food aid). They are listed as a separate column in Table 1. Sen's "own-production entitlements," which are relevant for smallholder farmers, are captured under the column agricultural production.

FAO's utilization dimension depends on various aspects, such as access to health, sanitation, food safety, and dietary quality. This dimension is highly relevant for our framework, since lockdown measures may cause shocks that undermine food utilization. For example, certain lockdown measures lead to declining access to health precautions and medical treatment for childhood diarrhoea, which particularly affects vulnerable groups (Biesalski et al., 2016; Leddy et al., 2020).

Stability is treated as a cross-cutting dimension in our conceptual framework and is, therefore, not represented by a separate column in Table 1. The dimension of stability is related to resilience, a term that conceptualizes how well different systems can absorb, adapt, and recover from shocks (Ansah et al., 2019; Béné et al., 2016; Pingali et al., 2005). Nutrition security resilience has both a short-term and long-term perspective (Béné et al., 2016). This is relevant in our context since both perspectives have to be considered when assessing the nutrition sensitivity of lockdown measures.

The columns in Table 1 display the dimensions of nutrition security identified above. They can be interpreted as pathways, by which specific lockdown measures affect nutrition security. The cells in Table 1 show a qualitative assessment of the expected effect of a lockdown measure on the respective pathway. The assessment is based on theoretical considerations and the available literature, as further detailed below.

We distinguish two broad categories of potential impact: "limited" and "strong." For effects that are not obvious, an explanation has been added in italics in brackets. Some measures are nutrition-sensitive by their nature: they do not affect any of the pathways in a significant way. Other measures can be made nutrition-sensitive by making exemptions or implementing countervailing measures. For example, school closures can affect access to school meals, but if alternative ways to distribute such school meals are established, their effect on nutrition security diminishes. Also, restrictions of internal movements have strong effects, though such effects can be reduced—in principle—if agricultural labourers are exempted, which can be difficult as countries may not be able to control and distinguish between agricultural and non-agricultural workers.

The final column in Table 1 presents a score, which indicates the number of dimensions for which a strong effect is expected. This score can be seen as an indication of the extent to which a specific lockdown measure affects nutrition security: the higher the score, the less nutrition-sensitive a measure—if no specific provisions are made to counter the effect. However, the score only reflects the number of pathways affected. The overall effect of a measure on nutrition security will depend on how large the effect is within each pathway. The last row presents a score that shows how many of the eight lockdown measures are likely to affect a particular dimension of nutrition security. This score, thus, reflects the pathways, which are expected to be most relevant for negative effects on nutrition security, if all lockdown measures were applied jointly.

Workplace closures could in principle have a very large effect on upstream and downstream food availability. Anticipating this problem, countries have typically made exemptions for farm production and food value chains. Therefore, Table 1 indicates that workplace closures are expected to have limited direct effects on food availability, as long as essential workplaces are exempted.

This was not always done during COVID-19. For example, wet markets were often closed, disrupting food supply chains and physical access to food (Pereira & Oliveira, 2020). Moreover, indirect effects are possible. For example, closing banks may affect farmers' access to credit for seed and fertilizer (Devereux et al., 2020). Workplace closures affect wage labour—i.e., for workers in the informal sector—in which jobs often require physical attendance and are not covered by unemployment schemes (Amare et al., 2021; Arndt et al., 2020; Barrett, 2020; Devereux et al., 2020; Jaacks et al., 2021; Mahmud & Riley, 2021; Wouterse et al., 2020).

Income drops may be mitigated by using savings or selling assets—undermining future resilience—but many households do not have such buffers (Laborde et al., 2020; Mahmud & Riley, 2021). Where private food and cash transfers are common, losing jobs does not only affect the breadwinners' households but also the people who receive food and cash from these households. Falling food demand may cause price declines, affecting farmers' revenues and future investments (Harris et al., 2020). In some cases, workplace closures may also have contributed to increasing agricultural production, for instance where migrant workers returned to rural areas and started to work on the farms.

Closure of public transport and **restrictions of internal movements** have similar effects, but public transport closures do not affect the mobility of people who have private means of transportation (unless private vehicles are included in the restrictions). However, they can disrupt agricultural production and the food supply chain, for example, by affecting the movements of agricultural workers as well as inputs and outputs (Ayanlade & Radeny, 2020; Ceballos et al., 2020; Hammond et al., 2022; Huber et al., 2018; Minten et al., 2020; Wouterse et al., 2020). Movement restrictions are likely to particularly affect the production of nutritious but perishable food such as dairy and horticulture products (Harris et al., 2020; Kansiime et al., 2020, Minten et al., 2020; Torero, 2020). Movement restrictions are likely to slow down the overall economy, thereby affecting own-labour entitlements, and may also undermine physical access to food (Hammond et al., 2022; Kansiime et al., 2020) and private transfers, as social networks can become disrupted at a crucial moment (Devereux et al., 2020). They can also affect access to health care, thus undermining food utilization.

Stay-at-home requirements are an extreme lockdown measure that affects not only the economic and physical access to food but also private and public transfer entitlements. Stay-at-home requirements particularly affect the physical access to non-storable and perishable food, which can inter alia affect food utilization by reducing dietary diversity (Harris et al., 2020). School closures can affect food transfer programmes, which are often organized via schools, thereby affecting children, who are among the most vulnerable to food and nutrition shocks (Ali et al., 2020; Laborde et al., 2020). In principle, alternative ways to distribute school meals during school closures can be used, such as take-home rations, vouchers, and cash transfers. However, targeting problems may occur. Prolonged school closures can affect educational achievements and, subsequently, job opportunities, inter alia.

Some measures are likely to have limited effects on nutrition security, particularly **restrictions on private gatherings, cancellation of public events**, and **international movement of people**. This is not to say that they have no effects. For example, **restricting private gatherings** may affect private transfer entitlements, to use Sen's terminology. Social events in rural areas, such as weddings and funerals, may provide poor people in a village with access to high-quality food, e.g., meat that they cannot afford otherwise (Jahnke, 1982, p. 74). **Cancellation of public events**, such as banning public church services, may affect the ability of food/cash programmes run by faith-based organizations to raise funds. Also, group-based extension delivery to farmers may be affected. **Restrictions on international movements** have disrupted supply chains for horticultural products, such as cut flowers and fruits that are typically transported in passenger planes (Laborde et al., 2020). Border control measures may lead to disruptions, even where agricultural and food commodities are exempted (Torero, 2020). **Restrictions on international movements** may also affect economic access for families relying on incomes from international migrant labourers.

Table 1 shows that the lockdown measures affecting most nutrition security dimensions are related to mobility and workplace closures. The closure of public workplaces affects five of eight dimensions, and restrictions on internal

movement and stay-at-home requirements affect four of eight dimensions each. Workplace closures affect three of eight dimensions. As the last row in Table 1 shows, the largest share of lockdown measures (five of eight) reduces nutrition security by affecting transfer entitlements and utilization. The next most important pathway is the impact on economic access, as four of the eight lockdown measures are likely to reduce economic access. Since lockdown measures that have a potentially strong impact on food availability (workplace closing and restriction on internal movement) were typically implemented with exemptions for agriculture and food chains, this impact pathway plays a relatively limited role as compared to the other pathways.

3 | EMPIRICAL METHODS

Two types of empirical evidence are used to assess the relevance of the impact pathways that were identified in the conceptual framework above. The first is a comparison of the stringency of different lockdown measures implemented by countries that differ in their food security status (Section 3.1). The second is an analysis of newspaper articles from five selected African countries (Section 3.2). The methods used to provide these two types of empirical evidence are described in more detail in the following.

3.1 | Stringency of lockdown measures in countries that differ by food security status

The calculation of the stringency of the different lockdown measures is based on data from the Oxford COVID-19 Government Response Tracker (Hale et al., 2020). The Tracker captures the government responses to the COVID-19 pandemic in 186 countries. Its lockdown dimensions comprise eight different measures, as shown in Table 1 above. The Tracker distinguishes three to four different levels of stringency for each measure on an ordinal scale. Aside from the lockdown measures on international movement, all restrictions have "flags," which indicate whether the measures are only applied in targeted regions or to the whole population. The stringency of each of the eight lockdown measures between January 2, 2020, and May 17, 2020, for each of the case study countries, was calculated as follows: the daily lockdown scores (points according to the ordinal categorization) for each of the measures were aggregated and rescaled by their maximum possible scores to create an index between 0 and 100.

In addition to exploring the lockdown stringency of the five case study countries, Section 4 also compares the lockdown stringencies between countries with low and high food security status. For this purpose, countries with a prevalence of undernutrition above 10% (World Bank, n.d.), using data from 2018, or a severe/alarming food security status according to the World Hunger Index 2019 (von Grebmer et al., 2019), using data from 2016–2018, were classified as having low food security (low FS). Countries with a prevalence of undernutrition below 10% (World Bank, null), using data from 2018, and no severe/alarming food security status according to the World Hunger Index 2019 (von Grebmer et al., 2019), using data from 2016–2018, were classified as having high food security (high FS).

3.2 | Content analysis of newspaper articles in five African countries

We draw on a content analysis of newspaper articles that deal with nutrition security effects of lockdown measures in five African countries to provide further evidence on the relevance of the different impact pathways identified by our conceptual framework: Zambia, Ghana, Benin, Kenya, and Uganda. These countries were chosen to reflect different levels of nutrition security before the outbreak of COVID-19—ranging from moderate in Ghana to serious in Benin, Uganda, and Kenya and alarming in Zambia—and different levels of political "freedom" (Freedom House, 2020), which can influence the incentives of governments to ensure nutrition security (Blaydes & Kayser, 2011; Sen, 1981, 2001; Thomson, 2019). Sen (2001) famously argued that, "no famine has ever taken place in the history of the world in

a functioning democracy" because governments "have to win elections and face public criticism, and have strong incentive to undertake measures to avert famines and other catastrophes."

The countries also have different government capacities as measured by the Quality of Government Index (see Table 2).

In each country, one of the largest public[2] and a main private newspaper were chosen: *The Lusaka Times* and *The Mast* in Zambia, *The Daily Graphic* and *My Joy Online* in Ghana, *La Nation* and *La Nouvelle Tribune* in Benin, *The Daily Nation* and *The Standard* in Kenya, and *The New Vision* and *The Daily Monitor* in Uganda. Due to challenges with the search function of some of the newspaper's online archives, articles were then identified with Google using the search terms "covid lock" and "covid cordon" (in Benin). The period of analysis was between January 1, 2020, and May 17, 2020, when the lockdown measures in most countries were eased again. Newspaper articles merely covering case numbers were excluded.

The remaining 1188 articles (in Zambia: 136; in Ghana: 437; in Benin: 81; in Kenya: 231; in Uganda: 304) were coded using the Qualitative Data Analysis (QDA) Miner software. Newspaper articles were pre-coded by five people on the author team using a jointly developed coding structure mirroring the dimensions of nutrition security developed in Section 2 and then coded by the lead author to ensure consistency. Only actual, observed food security effects stemming from the lockdown policies in the respective country were coded: theoretical warnings of possible effects were not coded and lockdown effects reported from other countries were not considered. Articles that discussed different food security effects of lockdown policies received multiple coding.

4 | EMPIRICAL EVIDENCE

4.1 | Evidence from statistical data

Figure 1 compares the lockdown response for countries with low and high levels of food security before the pandemic. The figure shows that countries with a lower level of food security are, on average, more likely to refrain from measures that have large effects on nutrition security, such as workplace closures and stay-at-home orders, or to enact them over a shorter period. Analysis of variance (ANOVA) and pairwise Tukey tests show that differences are significant for internal movement restrictions (10% level), school closures (5%), cancellations of public events, workplace closures, and stay-at-home requirements (1% level). Figure 1 also shows that countries—regardless of their food security status—pursued higher lockdown stringencies for measures that are less invasive and affect fewer dimensions of nutrition security, such as restrictions on private gatherings, school closures, cancellations of public events, and restrictions on international movement.

4.2 | Evidence from newspaper articles in five African countries

In this section, the effects of lockdowns on nutrition security in five African countries—Zambia, Benin, Ghana, Uganda, and Kenya—are explored empirically. Table 3 shows the COVID-19 lockdown strategies of the five case study countries, revealing how lockdown decisions have varied in countries characterized by low food security (which were grouped in Figure 1). Zambia has never restricted the movement of people (lockdown measures 2, 3, 4), but did close schools (lockdown measure 6) and entertainment workplaces (lockdown measure 1). A stricter lockdown was ruled out because of food security concerns, with the president noting: "I am aware that some of you have been saying, 'We would rather die from Covid-19 than from hunger.'" (Cara, 2020).

[2]In Africa, public newspaper ownership is a widespread phenomenon and such newspapers are among the most widely read in Africa (Moehler & Singh, 2011).

TABLE 2 Case study country characteristics

	Zambia	Benin	Ghana	Uganda	Kenya
Country characteristics					
Global Freedom Index (Freedom House, 2020)	54 *(partly free)*	66 *(partly free)*	82 *(free)*	34 *(not free)*	48 *(partly free)*
Global Hunger Index 2019 (von Grebmer et al., 2019)	38 *(alarming)*	24 *(serious)*	14 *(moderate)*	31 *(serious)*	25 *(serious)*
ICRG Indicator of Quality of Government 2020 (PRS, 2022)	0,42	NA	0,51	0,44	0,51
Newspaper/article selection					
Selected newspapers	The Lusaka Times, The Mast	La Nation, La Nouvelle Tribune	The Daily Graphic, My Joy Online	The New Vision, The Daily Monitor	The Daily Nation, The Standard
Number of articles (n)	136	81	437	304	231

Notes: The Global Freedom Index ranges from 0–100, with 100 indicating the highest degree of freedom. The Global Hunger Index ranges from 0–100, with values above 10 indicating moderate levels, above 20 indicating serious, and above 35 alarming levels. The Quality of Government Index ranges from 0 (lowest) to 1 (highest) and covers the variables "Corruption," "Law and Order," and "Bureaucracy Quality."

Benin established a cordon sanitaire—a quarantine zone—around the major cities for three weeks. People were allowed to move freely within and outside the zone but were not allowed to cross the borders of this zone. Food security concerns influenced Benin's lockdown, with the president saying: "Who can wait two, three, or four weeks even without working and living on monthly income?" (Vidjingninou, 2020).

Ghana followed a more stringent approach but only in its metropolitan areas, where stay-at-home requirements (lockdown measure 4) were enacted and non-essential businesses had to close (lockdown measure 1). Many measures were lifted after three weeks because of the "severe" nutrition security impacts on the poor and vulnerable (Adebayo, 2020).

Uganda enacted a hard lockdown, banning public and private transportation (lockdown measure 2), public gatherings (lockdown measure 7), closing all non-essential workplaces (lockdown measure 1), and closing schools (lockdown measure 6), and applying a dusk-to-dawn curfew (lockdown measure 4).

Kenya applied a nationwide dusk-to-dawn curfew similar to that of Uganda, but Kenya was less strict regarding the closure of businesses (focusing only on entertainment workplaces) and public transportation (only restricting the number of passengers).

Table 4 shows how the COVID-19 lockdown strategies of the five case study countries translated into the stringency assessments of the Oxford COVID-19 Government Response Tracker (between January and mid-May 2020). Uganda and Kenya were the most stringent of the five countries. On average, the five countries chose lockdown measures with fewer implications on nutrition security, such as restrictions of private gatherings (affecting one of eight nutrition security dimensions), school closures (affecting two of eight nutrition security dimensions), cancelling public events (affecting none of the eight nutrition security dimensions), and restrictions on international movement (affecting none of the eight nutrition security dimensions) (as set out in Table 1). However, Uganda and Kenya, in particular, enacted lockdown measures with potentially severe nutrition security implications, such as workplace closures (affecting three of eight nutrition security dimensions, see Table 1) and stay-at-home orders (affecting four of eight nutrition security dimensions).

Birner et al. (2021) consider the political economy of the lockdown decisions of the five African countries, suggesting that various factors explain lockdown stringencies, including political freedom, the expected scale of opposition, the capacity to offset adverse effects, the willingness to use state force to ensure adherence, food security considerations, and policy diffusion.

Table 5 shows how lockdowns have affected nutrition security in the five case study countries, based on a content analysis of articles published by the major newspapers in these countries (see section 3.2). Table 5 suggests that nutrition security effects occurred in all countries, but that they were most prevalent in countries with stricter lockdowns, such as Uganda and Kenya.

Across all countries, economic access to food was the most frequently mentioned nutrition security dimension, affected by four of the eight lockdown measures according to the conceptual considerations (see Table 1). Economic access was particularly undermined in Uganda, which imposed the most far-reaching workplace closures (lockdown measure 1), followed by Ghana and Kenya, which also enacted workplace closures but for a shorter period (in Ghana) and affecting fewer workplaces (in Kenya). The effects of workplace closures on economic access are illustrated by the following two quotes, of which the latter highlights the long-term effects of prolonged lockdowns:

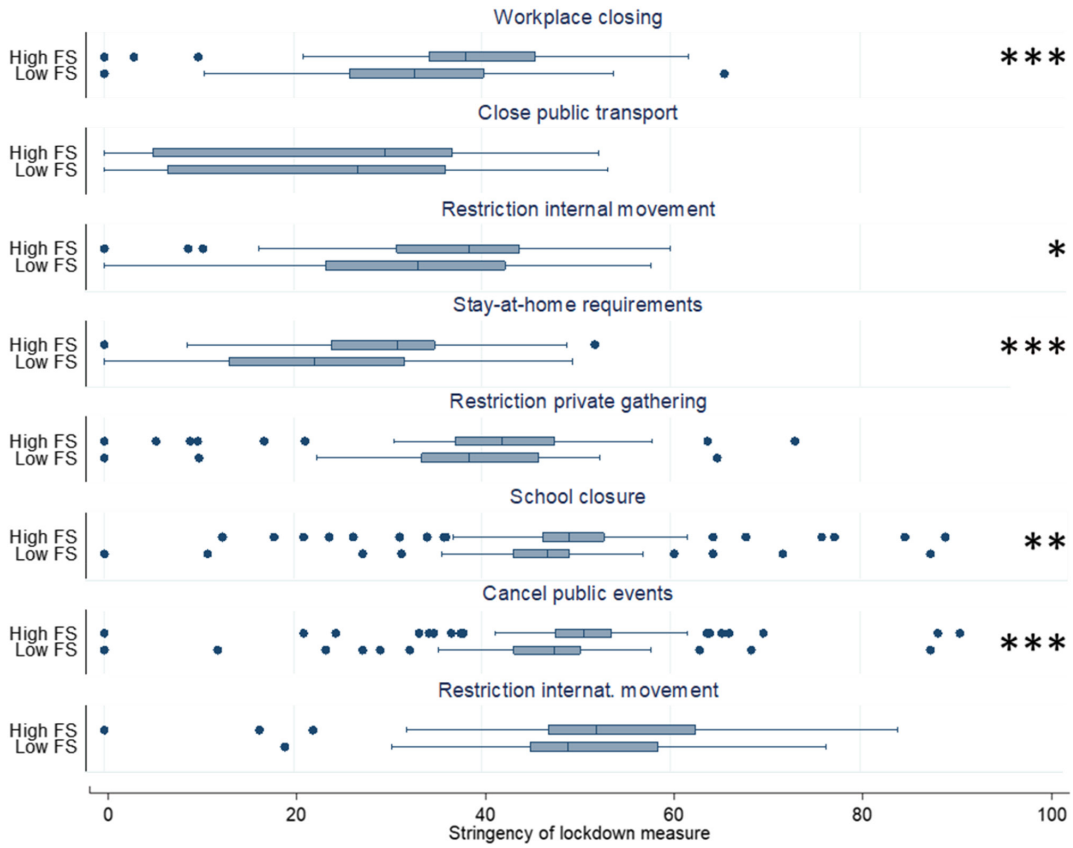

FIGURE 1 Stringencies of different lockdown types, comparing high and low food security (FS) countries. *Notes*: Lockdown stringencies between January 1, 2020, and May 17, 2020, based on data from the Oxford COVID-19 Government Response Tracker (Hale et al., 2020) (see section 3.1). Countries with a prevalence of undernutrition above 10% (World Bank, null), using data from 2018, or a severe/alarming food security status according to the World Hunger Index 2019 (von Grebmer et al., 2019), using data from 2016–2018, were classified as having low FS. Levene's test shows that the variances for each group are equal. The boxplots show the median stringency with the whiskers indicating the 25th and 75th percentile. Asterisks indicate significant differences at the 10% (*), 5% (**), and 1% (***) levels. Sample size: 176 countries.

TABLE 3 Lengths of lockdown measures in case study countries between January 1 and May 17

Type	Zambia	Benin	Ghana	Uganda	Kenya
(1) Workplace closing	Entertainment workplaces (30 days*)	Entertainment workplaces within cordon sanitaire (49 days)	Non-essential workplaces in major cities (21 days)	Non-essential workplaces (42 days#)	Entertainment workplaces (55 days)
(2) Close public transport	No	Ban of (mini) buses (49 days)	In major cities (21 days)	Yes (54 days)	Reduced capacity (59 days)
(3) Restrictions on internal movement	No	Cordon sanitaire (43 days)	In major cities (21 days)	Yes (50 days)	Yes (52 days)
(4) Stay-at-home requirements	No	No	In major cities (21 days)	Dusk-to-Dawn-Curfew (50 days)	Dusk-to-Dawn-Curfew (52 days)
(5) Restrictions on private gatherings	Max. 50 people (53 days)	Max. 10 people within cordon sanitaire (43 days)	Yes (63 days)	Max. 5 people (50 days)	Yes (66 days)
(6) School closure	Yes (59 days)	Yes (43 days)	Yes (63 days)	Yes (59 days)	Yes (64 days)
(7) Cancel public events	Max. 50 people (42 days)	Yes (62 days)	Yes (63 days)	Yes (61 days)	Yes (66 days)
(8) Restrictions on international movement	Screening/quarantine (89 days)	Screening/quarantine (59 days)	Ban of non-nationals/residents (63 days)	Screening/quarantine (119 days)	Ban of non-nationals/residents (62 days)

Notes: *Except bars and taverns. # Gradual reopening. Days were calculated from January 1, 2020, to May 17, 2020.
Source: Authors.

> "There has been loss of lives and devastating blows to economies and, particularly, livelihoods of citizens who live from hand to mouth" (Onyango-Obbo, 2020).

> "I have a family of three children and before receiving relief I was using my savings to buy food every day. Later, the money was exhausted when the President extended the lockdown for the extra 21 days" (Covid-19: How residents of Kabarole, 2020).

Stay-at-home orders (lockdown measure 4), which were enacted in parts of Zambia and Ghana and across Uganda and Kenya, can similarly undermine economic access to food (unless traveling to workplaces is specifically exempted). As shown in the conceptual framework, such a measure can potentially affect four of eight nutrition security dimensions. Unlike the closure of formal workplaces, such measures also affect informal workplaces. The effects of stay-at-home orders on economic access are illustrated by the following quote:

> "Vulnerable homes whose livelihoods depend on hand to mouth small scale businesses (…) have now reached their lowest ebb due to, among others, the stay-at-home preventive measure" (Lockdown has triggered rise in food prices, 2020).

TABLE 4 Lockdown stringencies in the case study countries.

Lockdown measures	Workplace closing	Closing public transport	Restrictions of internal movement	Stay-at-home requirements	Restrictions of private gatherings	School closure	Cancel public events	Restrictions of international movement	Average
Zambia	11	0	21	11	33	46	12	48	23
Benin	19	26	22	0	31	37	48	35	27
Ghana	23	26	10	12	39	49	49	58	33
Uganda	40	42	45	29	38	46	48	54	43
Kenya	36	31	41	30	52	50	52	60	44
Average	26	25	28	16	39	46	42	51	

Note: Between January 1, 2020, and May 17, 2020. Colours are based on conditional formatting of the unrounded values, ranging from dark green (0) to dark red (60).

Source: Oxford COVID-19 Government Response Tracker.

TABLE 5 Share (%) of newspaper articles reporting food and nutrition security effects.

Dimensions of food and nutrition security	Agricultural production	Food processing, sales, and trade	Economic access	Physical access	Transfers	Utilization	Average
Zambia (n = 136)	1	4	7	3	2	2	3
Benin (n = 81)	0	0	5	1	0	0	1
Ghana (n = 437)	1	2	13	6	1	0	4
Uganda (n = 304)	5	10	23	7	2	2	8
Kenya (n = 231)	1	6	11	4	2	0	4
Average	2	4	12	4	1	1	

Note: Between January 1, 2020, and May 17, 2020. Colours are based on conditional formatting of the unrounded values, ranging from dark green (0) to dark red (23).
Source: Authors.

Economic access was also affected by the mere anticipation of stay-at-home orders. This led to panic buying in all the countries and, subsequent price spikes, which undermine the economic access of poorer people to food, as the following quote from Ghana illustrates:

> "Amid the scramble for essential foodstuffs and products, price gouging and hoarding has been the order of the day" (Ayitey, 2020).

Stay-at-home orders are an extreme form of movement restriction. As with more mild forms of movement restriction, such as restrictions of internal movements and closing public transport (lockdown measures 2 and 3), which can potentially affect five of eight nutrition security dimensions according to the conceptual considerations, such measures can undermine the physical access to food and destroy private social safety nets, as the following quotes illustrate:

> "Our markets are mostly far from our residential areas especially in Accra and Kumasi where the lockdown is biting" (Bedzrah, 2020).

> "Lockdowns are also very difficult for people…whose survival is provided by friends and relatives through our African 'Ubuntu' culture" (Mwansa, 2020).

Restrictions of the internal movement of people and closing public transport systems also affected agricultural production, food processing, and sales, as the following quotes illustrate:

> "The restrictions on movement of vehicles are disrupting the supply-chain [of poultry] at various levels – hatcheries, feed mills, poultry farms and retail outlets. The fact that there is mortality and perishability involved in the trade makes it vulnerable" (Covid-19: How a poultry farmer, 2020)

> "With the ban of public transport, the food prices will increase because most of the vendors buy food from farmers who have been transporting it" (Vendors opt to sleep, 2020).

In principle, the negative effects of lockdowns on nutrition security, in particular the loss of economic access to food following workplace closures, can be mitigated with cash transfers and food aid, as long as governments can afford such programmes, and food is available. The case study countries that enacted strict workplace closures—Ghana, Uganda, and Kenya—set up such programmes. However, these suffered from various political economy and governance challenges. In Uganda, public food aid was misused to ensure votes for the imminent presidential elections, and

providing food aid outside the official government channels was forbidden (Anguyo, 2020). The politicization of food aid was particularly frequently reported in Uganda, but also appeared as a problem in Kenya and Ghana:

> "A woman has further lamented her ordeal of being denied food at Shiashie because she was not a card bearing member of the ruling NPP….This action if not curtailed with immediate effect will lead to satisfying party supporters rather than the targeted vulnerable women and children" (Politicisation of food sharing, 2020).

5 | POLICY IMPLICATIONS

Drawing on conceptual considerations, the emerging empirical literature, and a content analysis of Covid-19 effects in 1188 articles from 10 major newspapers in five African countries, this article has explored the effects of different lockdown measures on different dimensions of nutrition security. Disentangling such effects can help policy-makers design "nutrition-sensitive lockdown policies." The conceptual framework has shown that some lockdown measures, such as workplace closures and restrictions of movement, have far-reaching consequences on nutrition security, affecting several nutrition security dimensions, while others, such as banning public events, have limited effects. As such, measures such as the latter should be prioritized.

The framework suggests lockdowns particularly affect economic access to food—a nutrition security dimension that is undermined by workplace closures and restrictions of movement implemented in all case study countries. This hypothesized decline in economic access was confirmed by the content analysis—across the five countries, 12% of the coded newspaper articles mentioned this pathway. The emerging empirical research underlines the relevance of this pathway as well (Amare et al., 2021; Arndt et al., 2020; Devereux et al., 2020; Kansiime et al., 2020; Laborde et al., 2020).

While the conceptual framework has suggested that several lockdown measures undermine food transfers (which can be private and public), this pathway was not covered by the newspaper articles. Similarly, the newspapers did not frequently cover lockdown effects on food utilization, which our framework identified as a key nutrition security dimension that was affected. However, this may be because the dimension of food utilization is less tangible than other dimensions. For example, in contrast to declining access to calories, declining access to micronutrients is hidden—both to citizens and journalists—and the most affected population groups, such as women and children, may have less voice in public debates. Yet, while households may continue to access enough calories, dietary shifts towards cheaper, less nutritious diets may affect health and, for children, also mental and physical development, affecting them long after lockdowns are lifted (Kansiime et al., 2020; Leddy et al., 2020).

Both conceptual and empirical findings suggest the access pathway is more important than the food availability pathway. Therefore, guaranteeing access to food should be a top priority for policy-makers. Few newspaper articles reported challenges related to agricultural production at the time of the study, potentially because of widespread exemptions (e.g., allowing the free movements of agricultural labourers). However, some challenges may also become visible only after some delay and may have not been fully captured by the newspaper articles. Hammond et al. (2022) report a wide range of challenges that African smallholder farmers faced concerning COVID-19-related restrictions. Challenges related to downstream value chain steps such as processing, sales, and trade were reported more frequently by the newspapers, a trend that confirms the literature (Harris et al., 2020; Kansiime et al., 2020; Minten et al., 2020; Torero, 2020). However, overall, availability challenges were less commonly reported than economic access. The early emphasis on availability in the international debate on COVID-19 and nutrition security may have helped to ensure that agricultural inputs and outputs and food kept moving in the first phases of Covid-19. However, this emphasis may have drawn attention away from the important questions on how to ensure that citizens can keep accessing food in the first place.

Understanding the effects of different lockdown measures on nutrition security can help policy-makers design nutrition-sensitive lockdowns measures during COVID-19 and with future pandemics in mind. Policy-makers usually struggle to address multiple concerns at any given moment, and hence need to prioritize. Therefore, the following section identifies priorities based on the theoretical framework and the empirical findings:

1. Test-and-trace strategies should be prioritized by policy-makers, as long as they are sufficient from a containment perspective and as long as capacities for such a strategy exist, as lockdown measures can have implications on nutrition security.
2. If lockdown measures become necessary, countries should prioritize measures that have limited effects on nutrition security. For example, banning large public events has little effect on nutrition security.
3. If such measures are not sufficient, countries can enact measures which potentially damage nutrition security, but whose damage can be reduced with relatively simple counter-measures. For example, movement restrictions can reduce farm workers' mobility, thus undermining agricultural production and food availability, but such negative effects can be avoided by granting exemptions for anyone involved in farming. Similarly, school closures can have significant implications for nutrition security, but negative effects can be reduced by providing take-home rations when schools are closed.
4. Measures damaging to nutrition security and whose effects cannot (easily) be mitigated by means of counter-measures—or whose timely implementation is not feasible for some countries—should be avoided as far as possible unless the direct health effects of pandemics and endemics outweigh any trade-offs. For example, workplace closures and stay-at-home orders slow contagion, but they can heavily undermine the economic and physical access to food. In the case study countries that have relied on such measures—in particular Uganda and Kenya—negative nutrition security effects were more frequently reported, confirming the findings of Kansiime et al. (2020, p. 2), who found that these measures had "significant ramifications on food security." Whenever lockdown measures that can potentially undermine nutrition security have to be chosen, putting in place strong measures to guarantee the availability and access to food has to be a top priority for policy-makers.

In principle, cash transfers and food aid programmes can buffer the nutrition security effects of such lockdown measures (Gerard et al., 2020; Wouterse et al., 2020). In Ethiopia, for example, households participating in the Productive Safety Net Programme experienced only modest negative nutrition security effects (Abay et al., 2020). India is another example where such programmes played a big role to buffer the nutrition shocks experienced due to the economic slowdown and lockdown policies related to COVID-19 (Sinha, 2021).

However, merely accompanying otherwise "nutrition-insensitive" lockdowns with such social protection programmes may be both a costly and a dangerous strategy—in particular in countries with poor governance capabilities. All the case study countries relying on food transfers—Ghana, Kenya, and Uganda—faced governance challenges, such as targeting problems and political patronage, albeit to different degrees (see also Birner et al., 2021). In Uganda, for example, public food aid was misused for political patronage due to the imminent presidential elections, and food aid provided outside the official government channels was exposed to the charge of "attempted murder" (Anguyo, 2020).

Moreover, food aid typically consists of non-nutrient dense foods such as grain (Ong et al., 2020; Webb et al., 2017). This can cause hidden hunger, as such foods are filling but not sufficiently nutritious, and because their minerals are poorly absorbed (Biesalski, 2017). Cash-transfer programmes are preferable over food aid, where food is available, as they are less costly and less prone to governance challenges (Gentilini, 2016; Ravallion, 2020), but some lockdown measures can affect physical access to food, undermining the effectiveness of cash transfers. Moreover, setting-up ad hoc cash-transfer programmes is a major challenge (Arndt et al., 2020), especially in rural areas. Hammond et al. (2022, p. 9) report an "almost complete absence of direct aid or government support in every location studied" in rural areas in seven countries in the Global South.

The results suggest that all types of lockdown measures affect nutrition security. This highlights the advantage of soft measures, such as face masks and testing, tracing, and isolation strategies to contain the spread of contagious diseases. Some countries, such as South Korea or Vietnam, have been successful in using such strategies, some of which were drawing on community health infrastructure (Gilmore et al., 2020). Yet, using such strategies can be challenging for diseases with long incubation periods or a high proportion of asymptomatic cases, once infections are beyond a certain threshold and when test kits are missing. Moreover, implementing such strategies can be difficult, where public administrations are underfunded or people mistrust the government. Hence, there can be situations where such strategies fail

and lockdowns become necessary. In such cases, there is a large scope for "nutrition-sensitive lockdown policies," which maximize epidemiological benefits and minimize effects on nutrition security.

Lockdown strategies should aim to maximize overall (short-term and long-term) public health by identifying measures that are effective to "flatten the curve" and minimize negative trade-offs with nutrition security. Yet, there are lockdown measures that are particularly effective in flattening the curve but at the same time particularly problematic concerning nutrition sensitivity. This comprises measures related to workplace closures, which are effective to slow contagion but heavily undermine economic access to food, especially for non-farming households living "hand-to-mouth" (Arndt et al., 2020; Devereux et al., 2020; Kansiime et al., 2020; Laborde et al., 2020). Similarly, movement restrictions such as stay-at-home orders are a powerful tool to slow contagion, but they heavily undermine economic and physical access to food. Other measures are less affected by such trade-offs. For example, banning large public events can reduce "super-spreading" (Ebrahim & Memish, 2020; Haug et al., 2020) without compromising nutrition security.

Our article makes the case for nutrition-sensitive lockdown policies, but more research is needed, especially concerning policy recommendations for the future. We focus on the nutrition security of different lockdown measures but do not empirically study the effectiveness of different lockdown measures looking to flattening the curve. Thus, we look only at one side of the above-mentioned trade-off.

Future research should integrate the nutrition security effects of specific lockdown measures into epidemiological models (for an overview of COVID-19 models see Holmdahl & Buckee, 2020). Such models can capture the country-specific trade-offs between different lockdown measures regarding the efficiency to slow contagion (Haug et al., 2020) and nutrition security effects while taking into account health care capacities, the susceptibility of the population to become severely affected as well as the possibility of governments to set up supportive policy to mitigate the impacts of lockdowns measures. This can help to maximize overall (short- and long-term) public health and is important as, in many countries, the nutrition security effects of lockdowns may quickly outweigh epidemiological benefits (see also Meyerowitz-Katz et al., 2021). Coupled models could also help to explore whether circuit-breaker lockdowns—planned and repeated short-term lockdowns—are preferable to prolonged lockdowns (see also Chowdhury et al., 2020).

Future research should disentangle the short- and long-term effects of COVID-19 on nutrition security. Our empirical data ends with the end of the first wave of lockdowns. However, lockdown measures may also undermine the long-term resilience of households to shocks. Households that seemingly cope well with lockdown measures may—below the radar screen of governments—use up all their savings and have to sell their assets, making them vulnerable to a potential second lockdown or other shocks.

As such, how to make food systems more resilient to shocks should be another key research area (Ali et al., 2020; Torero, 2020). This includes resilience for all the above-derived dimensions of nutrition security (production, access, and utilization) and hence explicitly address both the supply and demand side of food systems. On the supply side, policy-makers may improve the level of preparedness for disease outbreaks by having dormant food aid or cash-transfer systems that can be activated in cases of emergencies.

On the supply side, there is a need to design agricultural production and trade in ways that enhance resilience to different types of shocks (such as COVID-19, trade risks, and climate risks). While local food systems may be more resilient to deal with global shocks, global food systems and trade may help to buffer local shocks, suggesting a need to carefully balance the advantages and disadvantages of both. In more resilient food systems, trade-offs between lockdown and nutrition security effects may be reduced.

The article suggests that governments, which face a deadly contagious disease such as COVID-19 and have a population that is susceptible to (hidden) hunger should carefully consider trade-offs between measures for the contagion of the virus and nutrition security. All types of lockdown measures can affect nutrition security as well as other aspects of public health, such as access to vaccinations and health precautions, which can have a large effect on the health of children (Zar et al., 2020). Depending on the situation, test-and-trace strategies may be sufficient (if government capacities allow) and lockdown measures may only be a second-best strategy, but if lockdowns become necessary, they should be designed to be nutrition-sensitive.

This in turn may help to ensure compliance with lockdown measures, as food-secure people are more likely to follow the enacted rules (Haug et al., 2020). Imposing strict lockdown measures and hoping to mitigate their negative effects on nutrition security with cash transfers and food aid seems to be a risky strategy given the governance challenges of such programmes, in particular when they are ad hoc responses (Arndt et al., 2020). However, cash transfers and food aid are essential where strict lockdowns have to be imposed. A long-term goal should be better governance to address potential challenges associated with both test-and-trace strategies and food transfer programmes and the design of more resilient food systems.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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