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IFPRI Discussion Paper 02121

May 2022

COVID-19 and Food (In)security in Africa

Review of the Emerging Empirical Evidence

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Abstract

COVID-19 risks rolling back many of the efforts and global successes recorded in reducing poverty and food insecurity. We undertake a systematic review of the growing microeconomic literature on the association between COVID-19 and food (in)security in Africa, discussing its implications for food policy and research. In doing so, we highlight some of the methodological weaknesses in answering policy-relevant questions on the causal link between COVID-19 and food insecurity. We also review the various coping strategies households are using to build resilience to COVID-19 and explore the role of social protection and other tools in mitigating some of the negative effects of COVID-19. This review provides evidence that COVID-19 is associated with food insecurity both ex-ante and ex-durante. There are many attempts to suggest this relationship may be causal with some robust methods in some contexts, but data limitations prevail which constrains causal learning. We also find evidence that income losses, loss of employment, and heightened food prices may be mediating the relationship between COVID-19 and food insecurity. Going further, we additionally review the mitigating role of social protection and remittances in reducing the negative effects of COVID-19 on food insecurity. Relatedly, we also show evidence that households are using various coping strategies such as food rationing and dietary change to cushion themselves against the COVID-19 shock but most of these measures remain adversely correlated with food insecurity. We end with a discussion on some potential interesting areas where future efforts can be geared to improve learning on the relationship between COVID-19, food insecurity, and building resilience to shocks.

Keywords: : COVID-19; food security, income shock, prices, resilience

JEL Codes: : F61, F62, H55, I38, Q18

1 Introduction

The coronavirus disease (SARS-CoV-2), hereafter referred to as COVID-19 continues to spread globally as there has been little success in effectively containing the virus. Originally described as a pandemic by the World Health Organization, there are emerging ideas of COVID-19 transitioning from a pandemic to an endemic (Steere-Williams, 2022). This is not to mean that its effects are getting mild or COVID-19 will come to a natural end as this errant assumption and endemic fatalism have been associated with misplaced complacency (Katzourakis, 2022). Different variants have been reported even with increasing vaccine rollout in many countries. There have been many talks on preventing the emergence of more dangerous but also more transmissible variants by ensuring vaccine equity for many developing countries (ibid). So far, COVID-19 has been associated with economic downturns and increased poverty rates in many developing countries, especially in Africa (Laborde, Martin, & Vos, 2021; Zeufack et al., 2020). Most African governments responded to COVID-19 by recommending and enacting lockdowns, travel restrictions, shelter in place, physical distancing measures, and some hygienic procedures to control the spread of the virus and save their health infrastructures (Durizzo, Asiedu, van der Merwe, van Niekerk, & Günther, 2021). These containment measures have been associated with increased risk to food insecurity, in a way that has shifted focus to viewing COVID-19 as a hunger pandemic.

In this paper, we synthesize the growing empirical literature on COVID-19 and food insecurity in Africa, discussing its implications for research and food policy. In doing so, we review the various mechanisms in the way of this relationship. Particularly, we document the association between COVID-19 with income and employment losses as well as price increases for various staple commodities consumed by poor households. We also explore the various ways households are coping with COVID-19 induced food insecurity such as reducing their consumption (food rationing) and relying on lower quality diets (negative coping mechanisms). Relatedly, we also review the role of remittances and social protection in building household resilience to the COVID-19 shock. Our review is entirely based on empirical analysis from countries in Africa that have relied on household surveys and analysis mostly ex-ante and ex-durante.

This review underscores a strong association between COVID-19 and food insecurity in Africa. The various containment measures and policies have been associated with reduced food consumption and in food security (Bloem & Farris, 2021). In the early days of the pandemic, there were indications of resilient food systems as little or no changes in food consumption and household dietary diversity were observed in some African countries like Ethiopia, Liberia and Malawi (Hirvonen, Minten, Mohammed, & Tamru, 2021). Over time, these associations have been outstandingly negative with insights from different countries and contexts. In some countries, there was also a locust outbreak which coincided with COVID-19 (Kassegn & Endris, 2021; Tabe-Ojong, Gebrekidan, Nshakira-Rukundo, Börner, & Heckelei, 2022). We

report significant income losses, which could explain these reductions in food insecurity. The containment policies have affected and reduced the income streams of many rural households who depend on numerous sources of income for their livelihoods. Similarly, work-related losses have been reported in many countries (Bargain & Aminjonov, 2021). Many households in developing countries depend largely on hands-on labour income given the huge informal sector prevalent in these countries. Most of these individuals have lost jobs due to the lockdown restrictions and stay at home policies.

Besides income and employment-related losses, significant price effects have also been reported due to panic buying, hoarding, and stockpiling. We review and provide evidence that prices for many staple foods have heightened during the pandemic (Adewopo, Solano-Hermosilla, Colen, & Micale, 2021; Aggarwal et al., 2020; Agyei et al., 2021; Dietrich, Giuffrida, Martorano, & Schmerzeck, 2022; Hirvonen, Minten, et al., 2021). We then explore the various mitigating strategies households are using to cope with COVID-19 induced food insecurity. Households are using adverse food coping strategies like reducing food intake and relying on less nutritious foods (Tabe-Ojong et al., 2022). They are also relying on support from friends, family, and the government (Dasgupta & Robinson, 2021, 2022; Maredia et al., 2022). The support from family and friends take the form of remittances (Akim, Ayivodji, & Kouton, 2022). Remittances and social protection relief have been shown to reduce food insecurity arising from COVID-19 (Abay, Berhane, Hodidinott, & Tafere, 2021; Akim et al., 2022). Furthermore, livestock and the adoption of improved storage technologies have been highlighted to be effective buffers to reduce food insecurity (Balana et al., 2021; Huss, Brander, Kassie, Ehlert, & Bernauer, 2021). We discuss these results and insights in light of food policy and research where we address both issues of internal and external validity. Most studies employ state of the art empirical methods to get at their findings, but data limitations prevent them from implying causality in the strictest sense about these relationships. Geographically, there seems to be multiple empirical evidence from some countries like Ethiopia, Kenya, Uganda and Nigeria while learning is limited in many countries in other regions of Africa like Central Africa, North Africa and some parts of Southern Africa.

This review offers the following contribution to the growing literature on the relationship between COVID-19 and food insecurity and the role of remittances and social protection in building resilience to COVID-19 and reducing food insecurity. First, it synthesizes the microeconomic literature on COVID-19 and food insecurity, making it easy to learn from this relationship at a broader scale. We are not the first to do this as Bloem and Farris (2021) and Picchioni, Goulao, and Roberfroid (2021) have undertaken some reviews on this subject in the context of low and medium-income countries. While Picchioni et al. (2021) focused on more empirical studies, Bloem and Farris (2021) only reviewed 8 studies, most of whose data followed up on earlier pre-pandemic surveys. Given the quick growth of evidence on this relationship, this review adds more empirical insights, exploring more thematic issues with a special focus on Africa where infection rates were low as compared to other regions in the

world. Second, we take a step ahead after documenting evidence on food insecurity by exploring and highlighting mediators in the way of this relationship such as income, prices, and employment. Third, we also review the various coping mechanisms households are using to reduce the effect of COVID-19 on their livelihoods and food insecurity. We also considered the role of remittances and social protection in relieving households and building resilience. Finally, we identify critical gaps in the literature and discuss their implications for policy and research agenda-setting.

The article is structured as follows. Section two provides an overview of the pandemic in Africa and the various containment policies rolled out and enacted by various governments. Section three looks at the methodology of selecting various articles for the review and the road map. The findings of the review are presented in section 4 while section 5 delves into some aspects of mitigating COVID-19 induced food insecurity using instruments such as social protection relief, coping strategies and remittances. The article discusses these findings and offers some deep thoughts and ideas for both research and policy.

2 Coronavirus pandemic in Africa and containment measures

COVID-19 originated in China in late December 2019 and has since then spread around the world, causing a pandemic. While more cases per million have been observed in higher-income countries, Africa is equally affected, recording just under 12 million cases and over 250,000 deaths as of April 2022 (Hasell et al., 2020). The first infection (in Africa) was reported in Egypt on 14 February 2020, while the first death in Burkina Faso was reported on 27 March 2020 (Lone & Ahmad, 2020). Even as new evidence emerges that majority of COVID-19 cases have not been reported due to low screenings (WHO, 2021), it is still arguably realistic that Africa has been relatively less affected by the pandemic in comparison to other regions. Confirmed cases account for only 0.3 percent of the global total and confirmed deaths account for 4.2 percent of the global total (Hale et al., 2021).

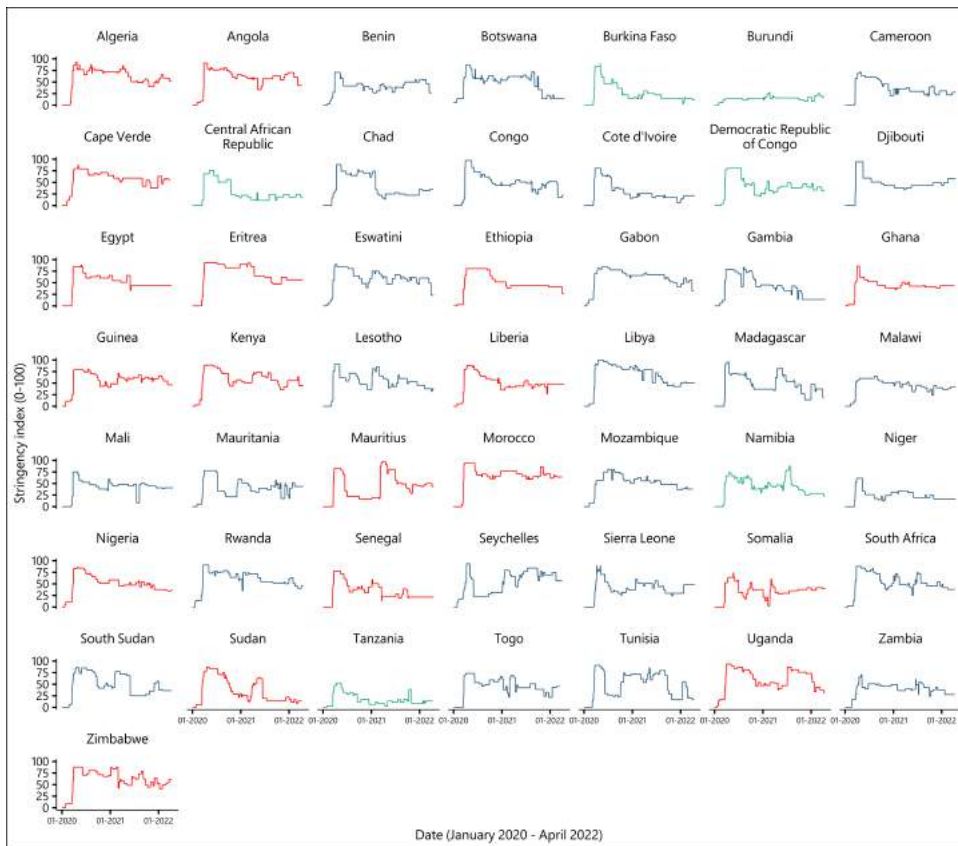
Nonetheless, at the onset of COVID-19, African countries implemented some of the most stringent control measures, including lockdowns, closure of education facilities, cancellation of public events, curfews, and restrictions on domestic and foreign travel among others. Considerable variation across countries was in how much such measures were mandatory and how they were applied to the general population uniformly (Haider et al., 2020). Uganda has recently lifted school closures and was on record for having the longest COVID-19-related school closures in the world (Sandefur, 2022).

The Oxford COVID-19 Government Reaction Tracker (OxCGRT) monitors the level of government responses across a variety of indicators and aggregates them into an index referred to as the Stringency Index. The index indicates the degree to which the government's policy

efforts to contain the spread of COVID–19 was stringent. The index value ranges from 0 to 100, with a higher value indicating greater limitations and vice versa. Additionally, OxCGRT gives a summary of the overall government response, aggregating indicators across four dimensions (containment and closure policies, economic policy, health system policies and vaccination policies). While Figure 1 illustrates the heterogeneity of government response stringency across countries, Figure 2 confirms the strict response of African governments during the early stages of the pandemic using the overall government response index relative to the rest of the world from 1 January 2020 to 21 April 2022.

Despite the low number of reported cases, the COVID-19 pandemic will leave Africa in a much worse-off situation than many other regions. Growth projections indicate that between 2020 and 2022, the African economy will decelerate growth by over 5% with even more recessions expected in the mineral and oil-dependent countries (Zeufack et al., 2020). Furthermore, initial evidence indicates that foreign direct investments are likely to be negatively affected (Hayakawa, Lee, & Park, 2022). Similarly, remittances to Africa have declined significantly (Ratha, Kim, Plaza, & Seshan, 2021). All these compounding effects of COVID-19 are likely to leave Africa in more precarious conditions, worsening poverty, and food security among other social development declines.

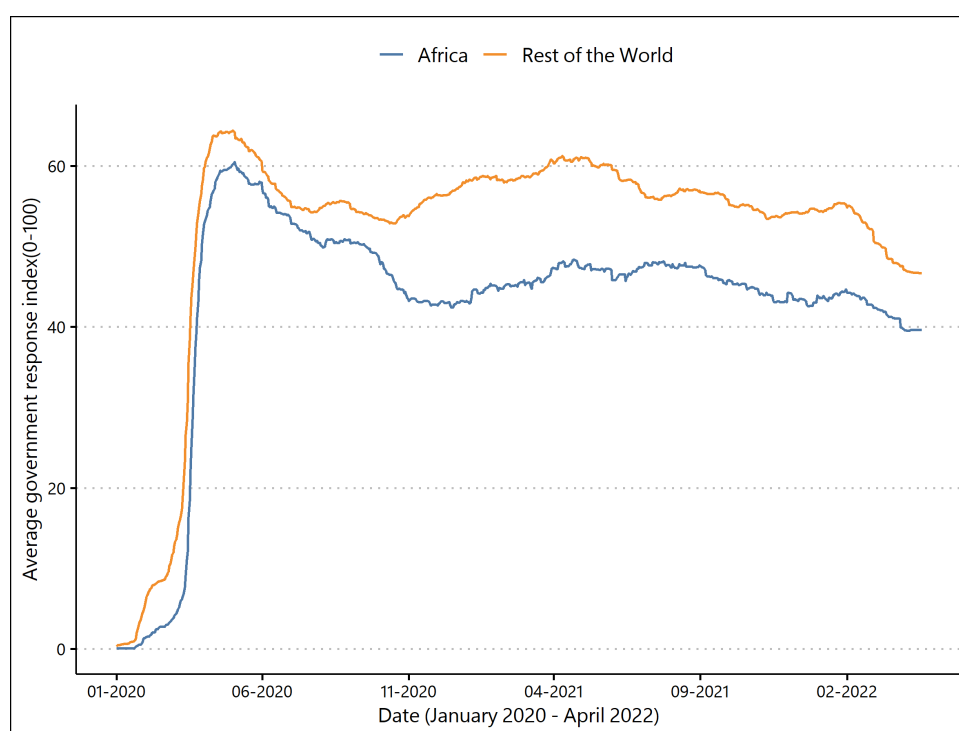
Figure 1: Stringency of Government responses to COVID-19 in Africa



Source: Author's construction using data from OxCGRT [Hale et al. \(2021\)](#).

Notes: The Red graphs show mean stringency values above 50, Blue between 30 and 50, and Green below 30.

Figure 2: Overall government response index overtime



Source: Author's construction using data from OxCGRT(Hale et al., 2021).

3 Methodology

Our review relies on published papers indexed in two databases; Web of Science and Scopus, as well as grey literature released as Working Papers. The two databases are some of the most comprehensive and precise social science databases for literature reviews (Gusenbauer & Haddaway, 2020). For Working Papers, we searched the websites of the World Bank (Policy Research Working Paper Series), the National Bureau of Economic Research (NBER Working Paper Series), the Institute for the Study of Labour (IZA Discussion Papers Series), the International Food Policy Research Institute (IFPRI Discussion Papers) and papers deposited on the Social Science Research Network (SSRN Papers). Our search covered the period of January 2020 to April 15, 2022. Our topical search strategy was based on a combination of COVID-19 or SARS-cov-19 or coronavirus and food security or food insecurity, or food prices, or food disruption, or food consumption or food access, combined using the appropriate Boolean operators, limiting the publication language to English only. All countries in Africa were listed¹.

¹An example of the Web of Science search: ((TS=("COVID-19" OR coronavirus OR "SARS-cov-19")) AND TS=("food security" OR "food insecurity" OR "food prices" OR "food access")) AND CU=(Angola OR Benin OR Botswana OR "Burkina Faso" OR Burundi OR Cameroon OR "Cape Verde" OR "Central African Republic" OR Chad OR Comoros OR "Congo Brazzaville" OR "Democratic Republic of Congo" OR Djibouti OR "Equatorial Guinea" OR Eritrea OR Eswatini OR Ethiopia OR Gabon OR Gambia OR Ghana OR "Guinea Republic" OR "Guinea Bissau" OR "Ivory Coast" OR Kenya OR Lesotho OR Liberia OR Madagascar OR Malawi OR Mali OR Mauritania OR Mauritius OR Mozambique OR Namibia OR Niger OR Nigeria OR Rwanda OR "Sao Tome and Principe" OR Senegal OR Seychelles OR "Sierra Leone" OR Somalia OR Sudan OR Tanzania OR Togo OR Uganda OR Zambia OR Zimbabwe)

Our initial search provided 3,944 documents majority of which came from Scopus. While Web of Science indexes published articles and the search tends to be more precise, Scopus further provides non-academic and grey literature. Through screening, we eliminated records that did not match the search intentions and those that did not clearly measure food insecurity. We excluded qualitative studies and mostly included studies based on household level data collection and regression analysis. This broadly involved pandemic household survey data collection that in most cases followed an earlier pre-pandemic data collection and, in some cases, these were randomized control trials (Aggarwal et al., 2020; Hirvonen, Minten, et al., 2021; Huss et al., 2021; Stein et al., 2022). We included simulation and modelling studies because while these might not study direct household experiences of food security, they can have a wider relevance in the economies studied. Altogether, we retained 38 records for full text review. Key summary insights from the reviews are provided in the supplementary material. The PRISMA diagram (Figure A1 in the supplementary material) below show the search, exclusion, and inclusion strategy. Out of the 54 African countries, only 21 have at least one study included in this review. Nigeria, Kenya, and Ethiopia had the highest representation (Figure 3).

Figure 3: Number of reviewed studies per country



Source: Author's visualization based on reviewed studies.

4 COVID-19 and Food Security

4.1 *Ex-ante* associations

Early in 2020 when many African governments were implementing various containment measures such as lockdowns and travelling restrictions, some ex-ante analyses were carried out to understand the potential impacts of the pandemic on food insecurity, agricultural production and yields as well as other key development outcomes like poverty and human capacity development. Using a single country Computation General Equilibrium model (CGE) that was calibrated using the 2013 Social Accounting Matrix for Burkina Faso, [Zidouemba, Kinda, and Ouedraogo \(2020\)](#) found results that are suggestive of a worsening food insecurity situation. They specified an optimistic and a pessimistic scenario based on the containment of the virus by the end of 2020 and the regular flow of exports and remittances. Food deficits were estimated to rise for both urban and rural households. Urban households were potentially found to be more resilient than the more vulnerable rural households.

Most of the simulation studies used various containment measures such as distancing, lockdowns and the stringency of lockdowns as various scenarios to predict food security and food system impacts ([Andam, Edeh, Oboh, Pauw, & Thurlow, 2020](#); [Arndt et al., 2020](#); [Jha et al., 2021](#); [Laborde et al., 2021](#); [Nechifor et al., 2021](#)). For instance, in South Africa, [Arndt et al. \(2020\)](#) highlighted the large economic costs imposed by distancing measures with implications for income and food insecurity. Relatedly, [Andam et al. \(2020\)](#) estimated the economy-wide impacts of lockdowns and found huge potential disruptions in agri-food systems in Nigeria. Given the already existing food insecurity situations in many countries before the pandemic, income support measures may be viable measures to induce the recovery of food systems ([Nechifor et al., 2021](#)). From a crop production perspective, COVID-19 can impact food production through labour disruptions and changes in the input supply chain. These disruptions could affect planting area and crop productivity of major cereals like maize, millet, rice and sorghum which form the staples of many developing nations ([Jha et al., 2021](#)).

4.2 *Ex-durante* associations

Beyond the ex-ante analysis on the impacts of COVID-19, the bulk of studies on COVID-19 and food insecurity have estimated the current or contemporaneous impacts of the pandemic on food consumption, dietary diversity, and food insecurity. Most of these studies have relied on household surveys conducted during the pandemic in various periods. Different measures of food insecurity were used with the most common being the Food Insecurity Experience Scale (FIES) ([Cafiero, Viviani, & Nord, 2018](#)). It is constructed based on eight questions about the experience of food insecurity (worry, healthy, few foods, skipped, eating less, running out of food, going hungry and not eating for whole days). Given the interest to keep surveys short since most surveys were through mobile phones, some studies only used one or more of these

eight questions. Other proxies of food insecurity that were used include; household dietary diversity score (Hirvonen, Minten, et al., 2021) , hunger scale, food gap (Abay, Berhane, et al., 2021) , food expenditures (Mahmud & Riley, 2021) , production and yields (Jha et al., 2021) , consumption pattern index (Maredia et al., 2022; Mueller et al., 2021) , food insecurity access scale and food disruption (Tabe-Ojong et al., 2022) , food prices (Dietrich et al., 2022; Hirvonen, de Brauw, & Abate, 2021) , hunger scale and food consumption score (Aggarwal et al., 2020) , as well as the coping strategy index and the reduced coping strategy index (Huss et al., 2021; Tefera, Tadesse, & Asmare, 2022).

Earlier surveys at the onset of the pandemic reported increases in food insecurity in many African countries² (Abay, Amare, Tiberti, & Andam, 2021; Adjognon, Bloem, & Sanoh, 2021; Agamile, 2022; Amare, Abay, Tiberti, & Chamberlin, 2021; Bundervoet, Dávalos, & Garcia, 2022; Dasgupta & Robinson, 2021, 2022; Egger et al., 2021; Ibukun & Adebayo, 2021; Tabe-Ojong et al., 2022). Most of these studies are based on the high-frequency surveys of the World Bank which follows up on some earlier pre-pandemic data as part of the Living Standard Measurement Surveys . These surveys are high-frequency surveys that have been collected in several existing LSMS countries and beyond (Bundervoet et al., 2022; Dasgupta & Robinson, 2021, 2022; Rudin-Rush, Michler, Josephson, & Bloem, 2022). Others are based on large base-line surveys which followed up with a phone survey at the onset of the pandemic (Tabe-Ojong et al., 2022). Some studies were entirely pandemic surveys , some of which were collected through random phone digit dialling (Egger et al., 2021; Maredia et al., 2022). Four studies are even based on large scale randomised controlled field experiments utilising studies set up in pre-pandemic periods (Aggarwal et al., 2020; Hirvonen, Minten, et al., 2021; Huss et al., 2021; Stein et al., 2022). Of the 26 reviewed studies, three studies focused on special vulnerable groups such as individuals living with HIV/AIDS (Enane et al., 2021; Folayan et al., 2022; Kavanagh et al., 2021; Stein et al., 2022; Wagner et al., 2021).

Although most earlier studies confirmed a strong positive correlation between various containment measures and food insecurity, earlier analysis from Ethiopia found food consumption and household dietary diversity to be unchanged which even increased slightly in August 2021 (Hirvonen, Minten, et al., 2021). This could be due to a partial lockdown in Ethiopia as opposed to full lockdowns in other countries. Also, food consumed away from home is just about 7 percent of food expenditures (Wolle, Hirvonen, de Brauw, Baye, & Abate, 2020). This implies that food distribution patterns likely did not change as a result of the pandemic, especially with partial lockdowns. Relatedly, it could also be the case that households have reduced consumption of non-food items given the various distancing measures (Hirvonen, Minten, et al., 2021). This reduction could most likely have been used to increase food consumption. Similar

²Table A1 shows the summary of studies included in the review across six dimensions (Countries, COVID measures, Measurement of food security, Type of data used, empirical strategy and highlight of results).

insights were also found in Liberia and Malawi, where no declines in household dietary diversity scores, hunger scale and food consumption scores were reported earlier in the pandemic (Aggarwal et al., 2020).

The overwhelming association between COVID-19 and food insecurity was confirmed by later surveys and panel data sets many months into the pandemic (Balana et al., 2021; Maredia et al., 2022; Rudin-Rush et al., 2022; Tefera et al., 2022). Although food insecurity persists in many African countries, some declines are being reported in Burkina Faso, Ethiopia, Malawi, and Nigeria (Rudin-Rush et al., 2022). It is even estimated that the percentage of households who were severely food insecure in earlier rounds of the survey dropped by 8 percent and an associated 5-percentage point increase in household dietary diversity scores (Balana et al., 2021). This follows a large rebound of about 50 percentage points in both income and jobs (Balana et al., 2021). Food insecurity as a result of the pandemic shows a strong association with mental health issues like anxiety and depression (Porter, Hittmeyer, Favara, Scott, & Sánchez, 2022).

There has been significant heterogeneity in the impacts of the pandemic on food security in various countries. Although it was projected that rural areas will be hit hard especially given their already high levels of food insecurity (Zidouemba et al., 2020), one would expect that urban areas will be rather more affected since most of the containment measures were mostly implemented and strictly followed (if at all) in the urban centres. In line with this thought, households in urban areas in Mali were found to be more affected than households in the rural areas which led to no gap in rural-urban food insecurity (Adjognon et al., 2021). Contrasting evidence was reported in Burkina Faso, Ethiopia, Malawi, and Nigeria where food insecurity was rather increasing in rural areas as compared to urban areas (Rudin-Rush et al., 2022). Maredia et al. (2022) further provided evidence of similar food insecurity impacts in both rural and urban areas of Kenya, Zambia, Mali, Nigeria, and Senegal. This points to the important role of context given that the underlying socio-economic and regulatory systems in all these countries may be different. Significant country heterogeneity were also reported in some of the multi-country surveys (Bundervoet et al., 2022; Dasgupta & Robinson, 2021, 2022; Egger et al., 2021; Mueller et al., 2021; Tabe-Ojong et al., 2022).

4.3 Mechanism and impact pathways

Three key mechanisms were identified as relevant in explaining the relationship between COVID-19 and food insecurity: income, price, and employment effects. As earlier mentioned, most of the studies proxied COVID-19 with the various containment measures put in place by many governments. These included lockdowns, social distancing and travel bans with lockdowns being the most used in many empirical studies.

4.3.1 Income effect

Income losses from COVID-19 have been the most reported cause of food insecurity. Most studies have established income losses as a result of various containment measures used in many African countries (Agamile, 2022; Balana et al., 2021; Bargain & Aminjonov, 2021; Bundervoet et al., 2022; Egger et al., 2021; Kansime et al., 2021; Mahmud & Riley, 2021; Maredia et al., 2022). Simulation analysis at the onset of the pandemic also estimated large income losses (Arndt et al., 2020; Zidouemba et al., 2020). Income losses have been argued to emerge from employment-related losses as a result of the containment measures (Mahmud & Riley, 2021). However, these losses could also be due to price increases, especially for households that depend on markets for leveraging their food demands. Early in the pandemic, it was established that lockdowns may jeopardise the consumption and food security situation of households especially those households who rely on labour income to finance food purchases (Arndt et al., 2020). Most of the above studies estimated income changes during the pandemic but some studies also estimated the direct associations between income losses arising from the containment measures and food insecurity. For instance, Hirvonen, Minten, et al. (2021) and Agamile (2022) proxied for COVID-19 using a reported COVID-induced income shock and estimated its association with food insecurity. Households faced with income losses resorted to a couple of options, most of which are associated with a reduction in food consumption and food insecurity (Mahmud & Riley, 2021). For those with associated wage income losses, food insecurity could be lessened if employment related losses push them to transition to the production of food crops and agricultural activities which they could use to balance up their food demands.

4.3.2 Price effect

When it comes to the price effects, COVID-19 has been associated with various changes in market and food prices, especially for common staples and vegetable crops (Aggarwal et al., 2020; Dietrich et al., 2022; Hirvonen, de Brauw, & Abate, 2021; Tabe-Ojong et al., 2022). These changes in consumer and farm prices have led to both winners and losers from the containment measures imposed by many governments (Hirvonen, de Brauw, & Abate, 2021). COVID-19 has led to large disruptions in food markets and market activity, which is reflected in price increases. Some country heterogeneity has been reported in food prices (Aggarwal et al., 2020). While COVID-19 has been associated with food price increases in Liberia, they have however declined in Malawi (Aggarwal et al., 2020). Controlling for seasonality, declines in prices are observed in Liberia. In Ethiopia, but also in Kenya, Namibia and Tanzania, Covid-19 has been associated with increases in consumer prices (Hirvonen, de Brauw, & Abate, 2021; Tabe-Ojong et al., 2022). These findings may suggest different aspects of panic buying, panic selling and hoarding of some food items. In Northern Nigeria, prices for the main staples increased by 30

to 50 % (Adewopo et al., 2021). In general, this was the same experience across Africa (Agyei et al., 2021). Dietrich et al. (2022) argue that increase in food prices seems to be due to mobility restrictions and the usual dependence of markets on trade pre-COVID.

4.3.3 Employment effect

Akin to income and price effects, the containment measures equally created employment shocks through the closure of various businesses and associated job losses (Balana et al., 2021; Bundervoet et al., 2022; Egger et al., 2021). Significant reductions in labour market participation and the probability of participation in non-farm business activities have been reported in Nigeria (Amare et al., 2021). Similarly, households in Uganda were found to report large wage income declines and reduced enterprise profits (Mahmud & Riley, 2021). These households were rather found to increase their labour supply to more farm production-oriented activities as a way of keeping up with wage income drops (ibid). Income losses have rightly been argued to emerge from employment losses (Mahmud & Riley, 2021). The impacts of unemployment induced shocks on COVID, proxied through business closures is associated with food security in Nigeria (Akim et al., 2022).

5 Resilience and mitigating food insecurity

Households responded to food insecurity using a couple of strategies. While some of these strategies were external to the household, some were in fact actions carried out by the households. In this section, we will cover some of the coping strategies households were using while the more external ones will be captured in the sections below.

5.1 Coping strategies

Households resorted to a couple of coping strategies such as food rationing and dietary changes to reduce the deleterious effects of COVID-19 on food insecurity. Particularly, households reported using coping strategies such as stockpiling, panic selling and buying, reducing food quantity and quality, reducing food diversity and relying on less nutritious foods, selling livestock, using existing savings and borrowing from friends, family, non-government organisations. (Balana et al., 2021; Dasgupta & Robinson, 2021, 2022; Mueller et al., 2021; Tabe-Ojong et al., 2022). Most of these coping strategies were however associated with food insecurity since they are food-based (Kansiime et al., 2021). In many cases, some of the coping strategies were not able to sustain households leading to persistent food insecurity and economic hardship (Egger et al., 2021). Some studies used the coping strategy index as well as the reduced coping strategy index as a measure of food insecurity (Huss et al., 2021; Tefera et al., 2022).

5.2 Role of social protection

As early as April 2020, many governments and various development and relief agencies began rolling out and augmenting relief support to households. This took the form of cash transfers, in-kind transfers (food support, school feeding), loans and credit schemes, public work programs, and utility waivers (Gentilini et al., 2020). These utility waivers were mostly for electricity and water bills and other financial payments. These waivers were geared at reducing the spread of COVID-19 through cashless payments. While targeting and access to these social protection programs were limited, it, however, reached some households in both rural and urban settings in different magnitudes (Maredia et al., 2022). While Balana et al. (2021); Egger et al. (2021); Tefera et al. (2022) established that government support was insufficient to enable households to bounce back to previous pre-pandemic levels, other studies showed that various relief support programs were able to protect and cushion households from the deleterious effects of COVID-19 (Abay, Berhane, et al., 2021; Dasgupta & Robinson, 2021, 2022). Dasgupta and Robinson (2022) found that cash benefits were more effective than food assistance in reducing food insecurity during the pandemic. Cash transfers were also found to improve food insecurity and dietary diversity despite no effects of lockdowns on food insecurity in Liberia and Malawi (Aggarwal et al., 2020). In an earlier analysis, (Nechifor et al., 2021) showed that governments can boost the recovery of food demand and the food sector through income support in Kenya, as earlier discussed in Arndt et al. (2020).

5.3 Role of remittances

Like cash transfers and other social protection programs which were rolled out by many governments and development agencies, households also received support from friends and relatives in the form of remittances. Remittances have been shown to mitigate the negative relationship between the COVID-19 induced employment shock on food insecurity in Nigeria (Akim et al., 2022). Here remittances from abroad were shown to have a larger impact than the domestic remittances. Moreover, remittances have more pronounced effects in rural areas than in urban areas, a finding which furnishes and supports the income effect on food insecurity. In this light, financial inclusion and asset ownership may have a similar mitigating role like remittances. For instance, livestock accumulation and social capital were two important factors that cushioned households from falling into severe food insecurity in Nigeria (Balana et al., 2021).

6 Research agenda, policy lessons and future steps

COVID-19 has been a global prolonged shock and will most likely leave economies and households in a depression that will take several years to recover. Studies on poverty and consumption have estimated that under an extreme scenario of income and or consumption drops of

about 20%, between 400 and 600 million people might fall back into poverty (Sumner, Hoy, & Ortiz-Juarez, 2020). And yet, evidence in this review indicates that the magnitudes of consumption decline, and food insecurity have been substantially higher than 20%. This might imply that retaining the same assumptions, poverty will have increased more than the current estimates suggest.

However, we also observe that majority of the literature is only correlations and hence only suggestive. A lot of papers not reviewed were only cross-sectional studies that can only tell a story at a point in time and do not provide clear causal assessments. For most of the literature, therefore, it is not possible to ascertain if COVID-19 caused higher food insecurity. Anecdotally, this is hard to refute, however. Indeed, as various containment measures kicked in, job losses increased, economic slowdown happened, and poverty and food insecurity would have increased. However, the literature currently does not get at these clear causal links. A few studies, especially those using World Bank High-Frequency Phone Surveys might bridge this evidence gap. They follow up households previously interviewed in the Living Standards Measurement Surveys and can therefore better account for pre-pandemic situations to point to pandemic related food insecurity more precisely with fixed effects regressions. We suggest more research in this direction. Future studies can combine survey and non-survey data. Some authors have utilised google mobility data to assess access to markets (Bundervoet et al., 2022; Dietrich et al., 2022) and poverty in general (Bargain & Aminjonov, 2021). Adewopo et al. (2021) used crowdsourced prices data to assess price changes in common staples in Northern Nigeria. These data are generally underused, yet they might be more readily available, real-time and bring a lot of value when combined with high-frequency phone surveys.

Second, we do not observe much literature that utilised local variation in COVID-19 prevention policies. Most of the papers using stringency index are only at the cross-country level. Cross country comparisons are useful and yet within-country differences also matter importantly. In some countries, regions were exposed to varying levels of stringency based on whether they were considered hotspots or not. Future research using country-wide representative data might consider exploring these within-country differences and heterogeneity.

Third, this review finds that there is very limited research in the understanding of how COVID-19 affected the food insecurity situation of already vulnerable groups such as refugees. Only one study, Stein et al. (2022) assessed COVID-19 and food insecurity in the context of refugees in Uganda. Other vulnerable groups might include internally displaced people and individuals living with HIV/AIDS, among others. While there was some research on the latter, we suggest more research should focus on these groups. As economies re-open, there will be feelings of lost opportunity to know how these specific subgroups fared. Indeed, their pre-existing vulnerability might imply that for these, the depth of poverty and vulnerability as a result of COVID-19 might be more far-reaching than the general population.

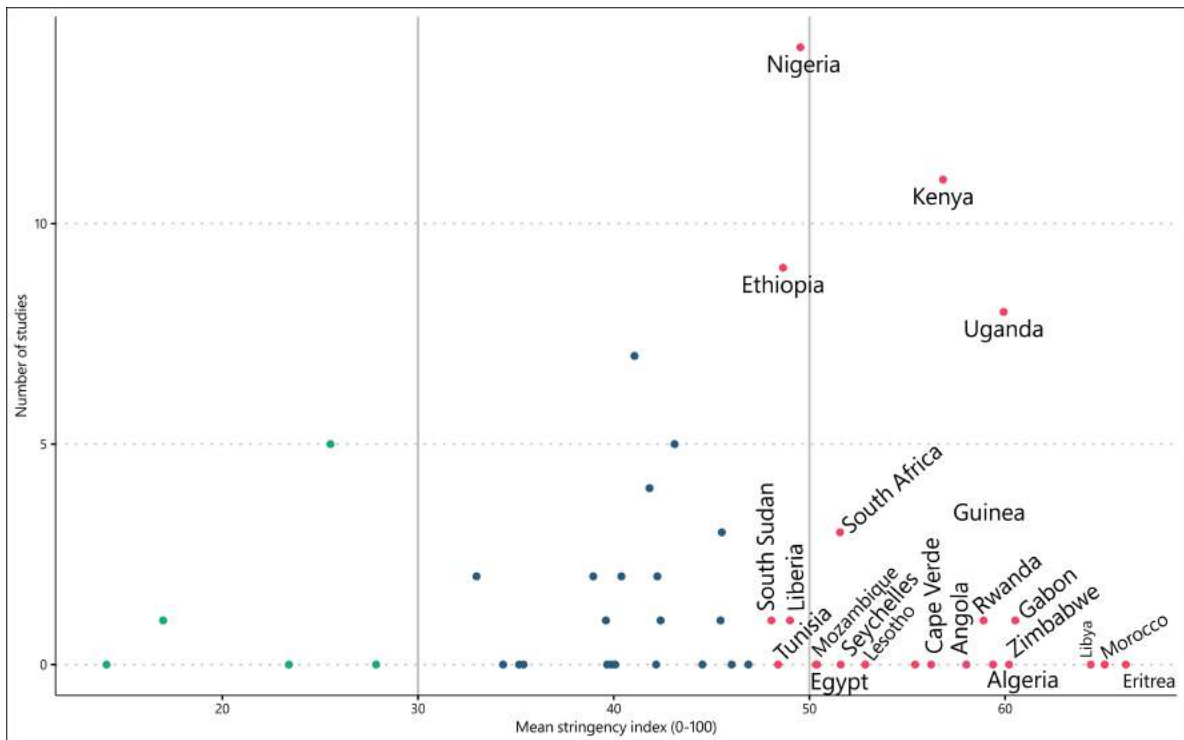
Fourth, future research can also explore additional shocks that would have compounded negative food insecurity experiences. One example is the locust infestation in the East and Horn of Africa in 2020. While the locust threat was recognised in the literature (Griffith, Pius, Manzano, & Jost, 2020; Salih, Baraibar, Mwangi, & Artan, 2020) and reports suggested over 44 million individuals in the Horn of Africa were at risk of acute food insecurity, we do not find any empirical evidence linking these two shocks. And yet, while rural households could have been somehow shielded from COVID-19 market disruptions, dependence on their farms for food supply would have been affected by locusts-related harvest losses. Evidence on locust coverage is thin. However, this can be assessed with for instance, remote sensing and other vegetation data. This could likewise be combined with household survey data to assess the extent of food insecurity associated with such compounding shocks.

Finally, in terms of geographical coverage, most of the studies on COVID-19 and food security are focused mainly in West and East African countries such as Nigeria, Ethiopia, Kenya and Uganda. As shown in Figure 3, very few or no insights are gotten from countries in Central, North and some parts of Southern Africa, except for South Africa. Given substantial in country and within country heterogeneity, this greatly limits generalizations of these insights from these studies to other countries with no insights. Of course, most of these countries are similar on many fronts which should make for easy generalizations but the national response to the shock has been different in these countries. Additionally, as illustrated in Figure 4, there is considerable variation in the number of studies conducted in different countries and the rigour with which governments respond. Numerous countries have stricter policies, but there are no studies examining their effects.

Our findings on the concentration of studies in countries like Ethiopia, Kenya, Nigeria and Uganda is not surprising given that it has been established that research across African countries is highly uneven (Porteous, 2021). While this has been argued to be triggered by language, population, security and safety conditions as well as the number of tourist arrivals, we additionally suggest in this case that this may be due to the availability of pre-pandemic data, research and existing soft infrastructures and research networks in these countries. This creates some sort of path dependency which leads to these locus of research outputs from these countries. That said, it may thus be worthwhile for future studies to delve into the largely unreported regions and countries so as to improve learning and generalizations on the relationship between COVID-19 and food insecurity in Africa.

In conclusion, this review sheds more light on the association of COVID-19 with food security in Africa. The review finds almost unanimous evidence that the pandemic has left and maintained households in food insecurity. The main pathways were through income reductions and related loss of employment and price increases making usual quantities of food unaffordable. Optimising various household coping strategies, existing and new social protection interventions and dependence on remittances provided some protection. The review concludes by exploring areas for future research including utilising non-survey data such as crowdsourced

Figure 4: Relationship between number of studies and average stringency index in Africa



Source: Author's construction using data from OxCGRT(Hale et al., 2021).

or mobility data, exploring the contribution of other shocks, insights from unexplored countries and regions and focusing on especially vulnerable groups such as refugees and internally displaced individuals among others.

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Supplementary material

Figure A1: PRISMA flow diagram for exclusion and inclusion

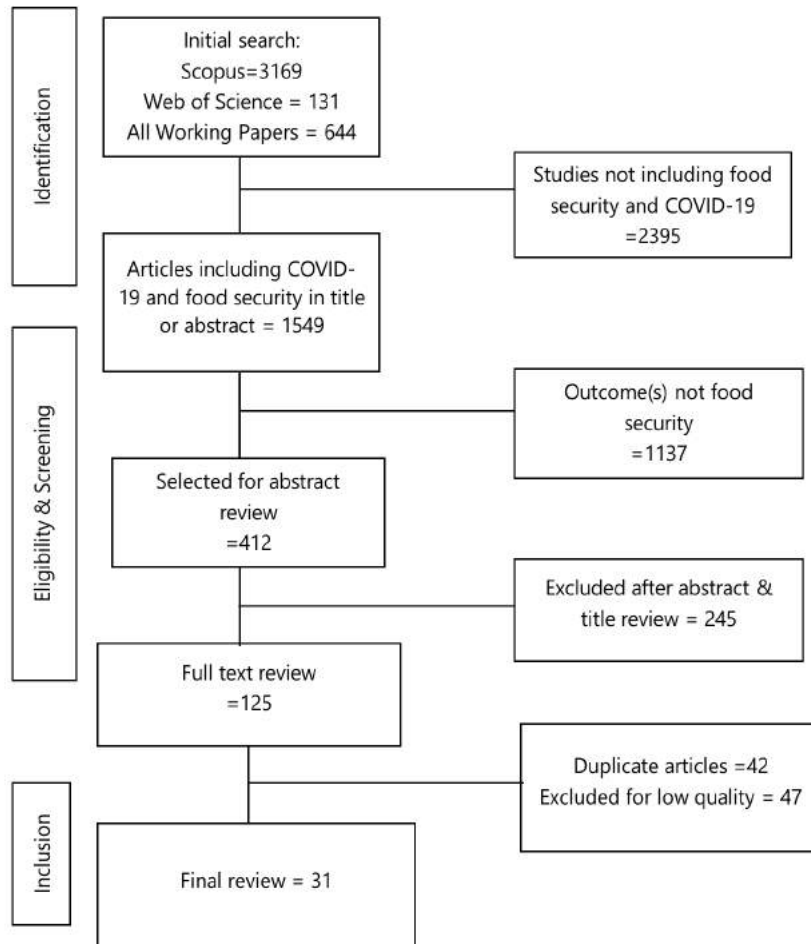


Table A1: Summary of reviewed studies

Authors	Countries	COVID measure	Measurement of Food security	Type of Data	Empirical strategy	Results
Andam et al. (2020)	Nigeria	Containment measures (lockdowns)	Agri-food systems and food supplies	Pre-pandemic data. Model is calibrated using the Social Accounting matrix for Nigeria	Multiplier model of Nigeria calibrated to a 2018 social accounting matrix.	Disruption in agri-food systems and food supplies
Arndt et al. (2020)	South Africa	Containment measures (lockdowns)	Food security	Pre-pandemic data. Model is calibrated using the Social Accounting matrix for South Africa	Simulation models	Increase in food insecurity
Aggarwal et al. (2020)	Liberia and Malawi	Containment measures (lockdowns)	Household dietary diversity score, hunger scale and food consumption score	Existing randomized control trial and pandemic surveys	Panel data analysis with fixed effects	No declines in food security
Zidouemba et al. (2020)	Burkina Faso	Scenario analysis based on control of COVID-19 (containment) and flow of remittances	Food consumption	Pre-pandemic data. Model is calibrated using the Social Accounting matrix for Burkina Faso	Computational General Equilibrium model	Increase in food deficits and insecurity
Adjognon et al. (2021)	Mali	N/A	Food Insecurity Experience Scale (FIES)	Pre-pandemic and pandemic surveys	Difference in Difference	Increase in food insecurity
Abay, Berhane, et al. (2021)	Ethiopia	Number of COVID-19 cases per zone	Food gap	Pre-pandemic and pandemic surveys	Household fixed effects difference in Difference and non linear models	Increase food gap and food insecurity
Abay, Amare, et al. (2021)	Nigeria	Number of confirmed COVID-19 cases per state	Variant of FIES	Pre-pandemic and pandemic surveys	Difference in Difference	Increase in food insecurity
Adewopo et al. (2021)	Nigeria	COVID-19 lockdown	Food prices	Crowdsourced price data	Descriptive analysis	Significant increase in prices of key staples
Agyei et al. (2021)	Multiple countries	COVID-19 cases	Food prices	Administrative data on prices and macro variables	Panel fixed effects	Increase in price of key staples
Amare et al. (2021)	Nigeria	Exposure to COVID-19 cases and lockdowns	Variant of FIES	Pre-pandemic and pandemic surveys	Difference in Difference	Increase in food insecurity
Egger et al. (2021)	Multi country ³	Containment measures	Variant of FIES Consumption expenditure and prices	Pre-pandemic and pandemic surveys	Descriptive statistics	Increase in food insecurity, increase in prices and decrease in consumption expenditures

³Countries include Burkina Faso, Ghana, Kenya, Rwanda, and Sierra Leone

Kansiime et al. (2021)	Uganda and Kenya	N/A	FIES	Pandemic surveys	Non linear models (probit)	Increase in food insecurity and the use of food based coping strategies
Laborde et al. (2021)	Global	Containment measures (lockdowns)	Food insecurity and diets	Pre-pandemic data	IFPRI's global general equilibrium model	Increase in food insecurity
Jha et al. (2021)	Senegal and Burkina Faso	N/A	Agricultural production and yields	Pre-pandemic data	Crop simulation models (DSSAT suite)	Disruption in the value chains of major cereals
Mahmud and Riley (2021)	Uganda	COVID-19 associated lockdowns	Food expenditures per adult equivalent	Pre-pandemic and pandemic surveys	Linear regression model (Pre- post comparison)	Decrease in food expenditures per adult equivalent
Hirvonen, Minten, et al. (2021)	Ethiopia	Covid-19 induced income shocks	Food consumption and dietary diversity	Existing randomized control trial and pandemic surveys	Pre and post comparison using a household fixed effect estimator	No change in food consumption and dietary diversity
Hirvonen, de Brauw, and Abate (2021)	Ethiopia	N/A	Vegetable prices	Pre-pandemic and pandemic surveys	Linear regressions	Increase in vegetable prices
Dietrich et al. (2022)	Multi country ⁴	Containment measures (mobility constraints)	Food prices	Pre-pandemic and pandemic surveys	Linear and instrumental variable regressions with fixed effects	Increase in food prices
Enane et al. (2021)	Kenya	N/A	Having enough food	Pre-pandemic and pandemic data	Descriptive analysis	Moderate food insecurity in households with teenagers living with HIV
Huss et al. (2021)	Kenya	Containment measures	Self-assessed food security (coping strategy index)	Existing cluster randomized control trial and pandemic surveys	Intent to treat analysis	Increase in food insecurity
Ibukun and Adebayo (2021)	Nigeria	N/A	FIES	Pre-pandemic and pandemic surveys	Ordered probit	Increase in food insecurity
Kavanagh et al. (2021)	Kenya	N/A	HFIAS	Pre-pandemic and pandemic surveys	Descriptive statistics and OLS regression	Increase in food insecurity in general. Higher odds with women in transactional sex work
Nechifor et al. (2021)	Kenya	Containment measures	Per capita expenditure, per capita calorie intake and presence of stunting in children	Pre-pandemic data. Model is calibrated using the Social Accounting matrix for Kenya	Computational general equilibrium model (CGE model)	Food insecurity and low calorie intake
Balana et al. (2021)	Nigeria	N/A	Dietary diversity and FIES	Pandemic surveys	Logit and ordered logit models	Reduction in food insecurity over time
Wagner et al. (2021)	Uganda	N/A	FIES	Pandemic data	Multivariate logistic regressions	Moderate food insecurity in HIV/AIDS patients. Higher food insecurity in patients with depression

⁴These were based on retail markets and not from households

Dasgupta and Robinson (2021)	Multi country ⁵	Containment measures	Variant of FIES	Pre-pandemic and pandemic surveys	Nonlinear models (probit)	Increase in food security
Dasgupta and Robinson (2022)	Multi country ⁶	Containment measures	Variant of FIES	Pre-pandemic and high frequency pandemic survey	Fixed-effects linear probability model	Increase in food security
Mueller et al. (2021)	Kenya, Nigeria	Knowledge of an infected person	Dummy for lack of food or money to buy food. Consumption pattern index Composite index of food insecurity	Longitudinal pandemic survey	Linear regression model	Increase in food security
Agamile (2022)	Uganda	Lockdown induced income losses	FIES	Pre-pandemic and pandemic surveys	Probit model and Ordinary least squares (OLS)	Increase in food security
Tabe-Ojong et al. (2022)	Kenya, Namibia, and Tanzania	COVID-19 countermeasures	Household food insecurity access scale Food access disruption	Pre-pandemic and pandemic surveys	Linear and Non linear models (Multivariate probit model and probit model)	Increases in food access disruptions and food insecurity and the use of food based coping strategies
Rudin-Rush et al. (2022)	Burkina Faso, Ethiopia, Malawi, and Nigeria	N/A	Food Insecurity Experience Scale (FIES)	Pre-pandemic and pandemic surveys	Difference in Difference	Increase in food insecurity which declines gradually
Bundervoet et al. (2022)	Multi country ⁷	Containment measures	Variant of FIES	High frequency andemic surveys(pre-pandemic data for Nigeria and Ethiopia)	Logit model. Difference in difference for Nigeria and Ethiopia	Increase in food insecurity
Porter et al. (2022)	Ethiopia,	N/A	Variant of FIES	Pandemic surveys	Descriptive statistic and time comparison	Increase in food insecurity
Tefera et al. (2022)	Ethiopia	N/A	Coping strategy index	Pre-pandemic and pandemic surveys	Random effect model	Increase in food insecurity
Maredia et al. (2022)	Kenya, Mali, Nigeria, Senegal, and Zambia	Containment measures	Food consumption, variant of FIES and vulnerability indicator	Pandemic surveys	Household fixed effect estimator	Decrease in food consumption and increase in food insecurity
Akim et al. (2022)	Nigeria	Business closure due to lockdown and number of COVID-19 cases per state	FIES	Pre-pandemic and pandemic surveys	Difference in difference	Increase in food insecurity
Folayan et al. (2022)	Nigeria	N/A	Going without food, cutting meal sizes and food access	Pandemic survey	Logistic regressions	Moderate increase in general population but higher increase in people with HIV/AIDS

⁵Countries include Chad, Djibouti, Ethiopia, Kenya, Malawi, Mali, Nigeria, South Africa, Uganda

⁶Countries include Chad, Djibouti, Ethiopia, Kenya, Malawi, Mali, Nigeria, South Africa, Uganda

⁷Countries include Burkina Faso, Djibouti, Ethiopia, Gabon, Ghana, Kenya, Madagascar, Malawi, Nigeria, South Sudan, Uganda, and Zambia

Stein et al. (2022)	Uganda	N/A	Food consumption , FIES	Pre-pandemic and pandemic data	ANOVA	Increase in food insecurity among refugee households. Attenuated by cash transfers
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