

Introduction

The COVID-19 pandemic has led to widespread economic and social disruptions around the world. In addition to potential exposure to a contagious and deadly virus, job losses and reductions in earned income persist for a large share of the world's population. Global poverty projections (based on the World Bank's PovcalNet and International Monetary Fund (IMF) data) suggest that, in 2020, the number of people living below the \$1.90 per day poverty line increased by at least 68 million and the number living below the \$3.20 per day poverty line increased by at least 140 million (Valensisi, 2020).¹ Compared to pre-pandemic projections, expected gross domestic product (GDP) growth rates completely reversed, declining from an expected expansion of 5.1 percent in the countries covered by the USDA, Economic Research Service's (ERS) International Food Security Assessment (IFSA) report to a contraction of -5.1 percent (Baquedano et al., 2021a).

The ERS food security projections further highlight a large increase in the number of people experiencing food insecurity around the world due to the COVID-19 pandemic (Baquedano et al., 2020; 2021). The IFSA model projects per capita food demand—based on expected changes to income, prices, and food supply—and compares this projection with a nutritional target of 2,100 calories per person per day (the United Nations Food and Agriculture Organization's (FAO, 2014) stated caloric level necessary to sustain a healthy and active lifestyle). The IFSA projection provides estimated levels of food security and nutritional intake in 76 low- and middle-income countries. In a follow-up article to the 2020 IFSA report, Baquedano et al. (2021) update the 2020–30 projections of global food security associated with the COVID-19 pandemic. These updates estimate that (in 2020) the number of food-insecure people reached 921 million, an increase of 160 million from pre-pandemic projections. The 2021 IFSA report projects the prevalence of food insecurity in 2021 will increase by nearly 291 million people (Baquedano et al., 2021b).

The IFSA macroeconomic projections help define the scale of the global consequences of the COVID-19 pandemic on food insecurity. The projections indicate a potential setback in recent global progress towards meeting the United Nation's Sustainable Development Goals and highlight a distinct challenge to ending hunger and achieving food security for all people by 2030 (Hoy and Sumner, 2020; Ravallion, 2020). These macroeconomic projections, however, are only designed to predict global, regional, and country-level changes in food insecurity; the projections are unable to provide insight into more nuanced, local-level, and within-country changes in food insecurity associated with the COVID-19 pandemic.

¹ More information about the World Bank's PovcalNet is available on the World Bank's website.

This working paper includes a review of microeconomic studies of local-level differences in food insecurity that are not captured by the larger scale macroeconomic projections. These insights include assessments of pandemic-related market disruptions, rural-urban differences, variations across socioeconomic groups, and the effectiveness of social projection programs. The emerging microeconomic literature, however, is limited in geographic scope as detailed microeconomic data are only available in a small share of countries around the world. Taken together, insights from macroeconomic projections and the emerging microeconomic literature complement each other and inform public and private decision makers about rapidly developing changes in international food insecurity associated with the COVID-19 pandemic.

This review includes two inclusion criteria. First, the authors have restricted the review to studies in low- and middle-income countries for two reasons: (1) to complement the existing projections of the IFSA model, which includes 76 such countries, and (2) because, while much has been written about food insecurity during the COVID-19 pandemic in the United States and other high-income countries (Ahn and Norwood, 2020; Gunderson et al., 2020; Santeramo and Dominguez, 2021; Zeballos and Sinclair, 2020; Ziliak, 2020), relatively little is known about changes in food insecurity in low- and middle-income countries, despite widespread concern (Arndt et al., 2020; FAO, 2020; Laborde et al., 2020; Reardon et al., 2020). Second, the authors focus on studies that analyze survey data measuring food insecurity from both before and after the onset of the pandemic. The studies included are either recently published—such as in the *American Journal of Agricultural Economics*, *Food Policy*, and *World Development*—or currently posted in the National Bureau of Economic Research (NBER) or International Food Policy Research Institute (IFPRI) working paper series. The existing studies that meet these inclusion criteria are listed and summarized in table 1 (Abay et al., 2020; Adjognon et al., 2021; Aggarwall et al., 2020; Amare et al., 2020; Ceballos et al., 2020; Hirvonen et al., 2020; Kansime et al., 2020; Mahmud and Riley, 2020). Other relevant studies that fall outside of these inclusion criteria are also discussed and help contextualize and explain the findings in this emerging literature. The authors have attempted to provide as detailed an understanding of the immediate and short-term changes in food insecurity amid the COVID-19 pandemic as possible at the time of writing this review.

Six Preliminary Lessons

There are six lessons from the emerging microeconomic literature on changes in food insecurity associated with the COVID-19 pandemic. Throughout this review of studies, the authors refer to specific parts of table 1, which provides the background and key findings of the eight studies that meet the inclusion criteria. For each study, table 1 summarizes information about: (a) The geographic area and timeframe, (b) the data source, (c) the outcome variable measuring food insecurity, (d) the empirical method used, and (e) the key finding of the research. There are also four questions assessing if certain conclusions can be drawn from the study. The questions ask—in addition to whether pandemic-related disruptions explain the results—whether results differ by urban versus rural location, economic status, or access to social support.

Table 1

Summary of studies on the COVID-19 pandemic and food insecurity

	Abay et al. (2020)	Adjognon et al. (2021)	Aggarwal et al. (2020)	Amare et al. (2020)	Ceballos et al. (2020)	Kansiime et al. (2020)	Mahmud and Riley (2020)	Hirvonen et al. (2020)
A: Published?	IFPRI Discussion Paper	Food Policy	NBER Working Paper	IFPRI Discussion Paper	World Development	World Development	World Development	American Journal of Agricultural Economics
B: Geographic area	Rural Ethiopia	Mali	Rural Liberia and rural Malawi	Nigeria	Haryana and Odisha, India	Kenya and Uganda	Rural Uganda	Addis Ababa, Ethiopia
C: Geographically representative?	No	Yes	No	Yes	No	No	No	Yes
D: Data source	Phone survey from ongoing project	LSMS and follow-up phone survey ⁱ	Phone survey from ongoing project	LSMS and follow-up phone survey	Phone survey from ongoing project	Online survey	Phone survey from ongoing project	Phone survey from ongoing project
E: Pre-survey date	March - August 2019	October 2018 - July 2019	January 2020	July 2018 - February 2019	April 2020	Pre-pandemic recall	March 2020	August - September 2019
F: Post-survey date	June 2020	May - June 2020	August 2020	April - May 2020	May 2020	April 2020	May 2020	May - August 2020
G: Short-term results?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H: Empirical method	Difference-in-differences ⁱⁱ	Pre-post comparison and difference-in-differences	Panel data with fixed effects	Difference-in-differences	Pre-post comparison	Pre-post comparison	Pre-post comparison	Pre-post comparison and difference-in-differences

I: Outcome variable	Food gap ⁱⁱⁱ	Food Insecurity Experience Scale (FIES) ^{iv}	Diet diversity, hunger scale, and food consumption	Partial Food Insecurity Experience Scale (FIES)	Food availability and access indicators	Food Insecurity Experience Scale (FIES)	Food expenditures per adult equivalent	Food consumption and diet diversity
J: Key finding	<i>Increase</i> in food insecurity	<i>Increase</i> in food insecurity	<i>No change</i> in food insecurity	<i>Increase</i> in food insecurity	<i>Mixed</i> results	<i>Increase</i> in food insecurity	<i>Decrease</i> in food expenditures	<i>No change</i> in food insecurity
K: Do pandemic-related disruptions explain the result? ^v	Yes	Yes	N/A, markets disrupted, but food insecurity remained stable	Yes	Yes	Yes	Yes	N/A, income and job loss, but food consumption remained stable
L: Do results differ in urban versus rural areas?	N/A	Yes	N/A	No	N/A	N/A	N/A	N/A
M: Do results differ by socio-economic status?	N/A	N/A	N/A	Yes, more adverse changes for poorer households	N/A	N/A	Yes, more adverse changes for wealthier households	N/A
N: Do results differ by access to social support?	Yes, Productive Safety Net Program (PSNP)	N/A	Yes, cash transfers	N/A	N/A	N/A	N/A	N/A

Notes: This list includes the authors' tabulation of studies that analyze an outcome variable measuring some dimension of food insecurity over time, with measures pre-dating the pandemic and measures collected after the onset of the pandemic. Many studies, which we discuss in this article, do not meet these criteria.

ⁱThe Living Standards Measurement Study (LSMS) is a series of household surveys conducted by the World Bank.

ⁱⁱ A difference-in-difference regression specification is like a pre-post comparison, but the pre-post difference is combined with a difference across two groups.

ⁱⁱⁱThe "food gap" is the number of months the household was not able to satisfy its food needs (Berhane et al., 2014). ^{iv}The Food Insecurity Experience Scale (FIES) is a measurement tool used to estimate the extent of the multidimensional experience of food insecurity (Smith et al., 2017).

^vPandemic-related disruptions can include government-mandated lockdowns or individual behavior change due to fear of contracting COVID-19.

Source: USDA, Economic Research Service.

Food Insecurity Increases Amid the COVID-19 Pandemic

The key finding for each of the studies that meet our inclusion criteria is summarized in row J of table 1. Five studies find evidence of increasing food insecurity associated with the COVID-19 pandemic (Abay et al., 2020; Adjognon et al., 2020; Amare et al., 2020; Kansiiime et al., 2020; Mahmud and Riley, 2020). Two studies find no

evidence of changes in food insecurity associated with the COVID-19 pandemic (Aggarwal et al., 2020; Hirvonen et al., 2020).

The existence or absence of food security is a multidimensional concept. Commonly, food security is considered to have been achieved when each of four interrelated components are met: Availability (a physical supply of food at a local or national level); access (affordable food in sufficient quantity); utilization (the meeting of all nutritional needs); and stability (uninterrupted ability to meet food needs) (Thome et al., 2019). The following discussion highlights the food security findings of these studies and notes the specific dimension(s) of food security measured by each study.

First, studying rural households in the highland regions of Ethiopia, Abay et al. (2020) used phone survey data from an ongoing project and found that, compared to survey responses in March-August 2019, the fraction of households reporting the inability to satisfy their food needs had increased by June 2020. In addition, Abay et al. (2020) found that these households reported an increase in the number of months in which the households had been unable to satisfy their food needs amid the COVID-19 pandemic. As this measure of food security lets the households define their food needs, the change in food insecurity cannot be attributed to a specific food security dimension. Abay et al. (2020) also showed that this adverse change in food insecurity is virtually offset by participation in Ethiopia's Productive Safety Net Program. This change is discussed in more detail in section 2.6.

Second, using nationally representative data from Mali, Adjognon et al. (2021) found that moderate food insecurity—as measured using the Food Insecurity Experience Scale (FIES)—increased between a pre-pandemic household survey and a phone survey implemented three months after the first recorded cases of COVID-19 in Mali.² The FIES is specifically designed to measure the food access dimension of food security (Ballard et al., 2013). In reviewing differences between changes observed in rural and urban areas, Adjognon et al. (2021) found that the measured change in food insecurity was almost entirely driven by changes within urban areas (with very little change observed in rural areas). Adjognon et al. (2021) further noted that these contrasting changes in food insecurity could be plausibly explained by the presence of deeper and more dramatic initial pandemic-related disruptions in Mali's urban areas than its rural areas.

² The Food Insecurity Experience Scale (FIES) is a survey tool developed by the Food and Agriculture Organization of the United Nations to measure food insecurity, based on the direct experiences of people relating to food security (Ballard et al., 2013; Smith et al., 2017; Cafiero et al., 2018). This experience-based measure of food insecurity offers greater precision than other measures that rely on country-level food supply estimates (Coates, 2013; Smith et al., 2017).

regression specifications.⁶ Due to the nature of the COVID-19 pandemic, which influenced the entire world to some extent, credible identification of the impact of the pandemic on food insecurity—among its many other effects—is particularly challenging. There is no obvious comparison in the data to any group of people that has not experienced some form of disruption from the COVID-19 pandemic, and the disruptions are still ongoing. This is a limitation of all studies in this emerging literature (and of studies on the economic consequences of the COVID-19 pandemic) (Goodman-Bacon and Marcus, 2020). Without reliable data on COVID-19 infection rates, it is difficult to understand the overall extent of the spread of the virus, the timing of local surges in COVID-19 cases, and which geographical areas and communities have been most deeply affected by the pandemic. This lack of information limits anyone’s ability to disentangle the effect of the pandemic from, for example, the effects of seasonality or within-country variations such as rainfall, temperature, or conflict. Despite these limitations, analysis of changes in food insecurity associated with the COVID-19 pandemic provide useful insights that policy makers around the world can use in the short-, medium, and longer-term aftermath of the pandemic.

Different Measures of Food Insecurity Across Studies

The primary outcome variable (or variables) used to measure food insecurity in each of the studies that meet our inclusion criteria is given in row I of table 1. Three studies use the Food Insecurity Experience Scale (FIES), which asks a series of questions to elicit a household's experience with food insecurity (Adjognon et al., 2021; Amare et al., 2020; Kansime et al., 2020). The other studies use a variety of indicators as a proxy for food insecurity, such as the amount of dietary diversity and food consumption (Aggarwal et al., 2020; Hirvonen et al., 2020), food expenditures (Mahmud and Riley, 2020), the food gap (Abay et al., 2020), and food access (Ceballos et al., 2020). The variety of survey tools used to measure food insecurity make clear comparisons between studies challenging.

Food security is a complex concept that often looks different in various geographical parts of the world. The FAO uses a broad definition of food security that highlights the multidimensional nature of the concept. According to the FAO, food security exists when, “all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy lifestyle” (FAO, 1996; FAO, 2009). Although this definition of food security is widely accepted, challenges persist in consistently measuring food security across time and space (Carletto et al., 2013). Despite this challenge, it remains possible to learn lessons from the emerging literature if researchers take care to avoid

⁶ A difference-in-difference regression specification is like a pre-post comparison, but the pre-post difference is combined with a difference across two groups.

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