1. Beyond initial impacts: The evolving COVID-19 context and food system resilience

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As we mark the second anniversary of the start of the COVID-19 pandemic, the health, economic, and social disruptions associated with this global crisis continue to evolve. The impacts of the pandemic are prolonged and likely to endure for years to come. Poor, marginalized, and vulnerable groups have been disproportionately affected, with informal and migrant workers, refugees and displaced persons, and women and children particularly vulnerable and adversely impacted.

The COVID-19 pandemic has highlighted the interrelationships between disease emergence and spread, different actors and segments of the agrifood system, and the multifaceted effects of the crisis. These complexities require policy responses grounded in solid evidence and supported by systemic research. Increased constraints on fiscal resources — in part a consequence of the continuing crisis — demand that such policies be informed, smart, and effective, contributing to agrifood system resilience and protecting the most vulnerable. Responses must be coordinated, linking health, environmental, social, and financial objectives, and their implementation should minimize unintended harms. In addition to emergency response measures such as income support programs, policies focused on the most vulnerable groups must target their basic needs, including sanitation and nutrition, to improve their ability to cope.

Our previous book, *COVID-19 & Global Food Security* (Swinnen and McDermott 2020), focused on the multiple disruptions and impacts of the COVID-19 pandemic during the first six months of 2020. Key messages demonstrated how fears of poor health and a global recession, movement control, and other health measures had major impacts on households, particularly on poor and vulnerable people. We also found that disruptions occurred across all sectors — health, economic, food, social programs, and education. However, food production, supply, and trade were relatively protected from shocks, as they were considered essential and production was concentrated in less population-dense areas. In this book, we focus on the lessons learned in the subsequent months that have direct implications for food security and food system resilience.

Evolving COVID-19 context

Since the onset of the COVID-19 pandemic in 2020, both the impacts of the crisis and responses to it have evolved substantially. As the timeline of major COVID-19 events and summary figures of cumulative cases and deaths illustrate, the pandemic is truly global in nature and carries a reported mortality rate of approximately 2 percent. However, these figures cannot demonstrate the dynamic nature of the pandemic, with its multiple waves and the emergence of new variants. These waves reflect the

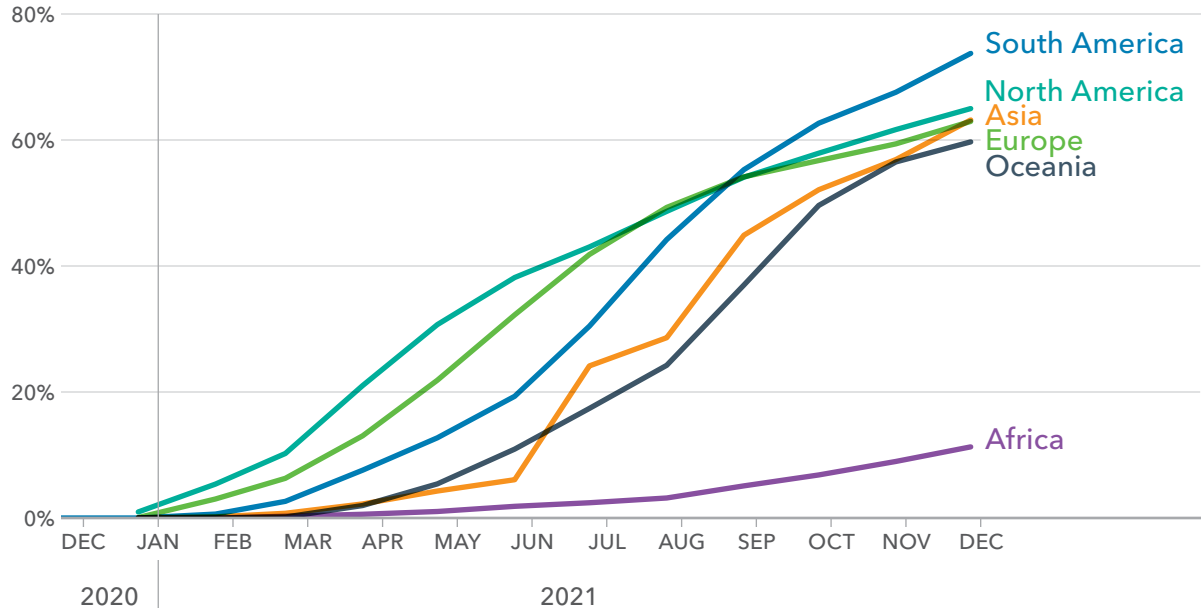
exponential nature of transmission as outbreaks shift to different regions and countries. The evolving nature of COVID-19 and lagging rates of vaccination have led to a recognition that the disease will persist, unlike the original SARS that was eliminated in 2003. The current expectation is that we will transition to endemic COVID-19, with ongoing waves and managed mortality and morbidity similar to influenza.

In many countries, one of the major challenges of the evolving pandemic has been that control efforts are retroactively implemented in response to the exponential growth of infections and the deaths that lag two to three weeks behind. Even in many rich countries, health systems have struggled to monitor infections and SARS-CoV-2 variants and to proactively implement disease control measures. In lower-income countries, health systems are much weaker and can be overwhelmed by waves of COVID-19. The difficulty of confirming COVID-19 cases and deaths reflects these challenges. In general, deaths are the easiest health statistic to measure, but counting COVID-19-associated deaths has been complicated. Comparing COVID-19 reported deaths with all deaths in a specific time period is one way to enhance evidence on mortality. "Excess" deaths associated with COVID-19 are estimated to be approximately 3–4 times the reported number of COVID-19 deaths (*Economist* 2021). The largest discrepancies between total deaths and reported deaths come from South Asia and Africa. In South Asia, a very high-mortality wave of COVID-19 overwhelmed health systems in March and April 2021. In remote areas of Africa, confirmation of COVID-19 has been challenging and not all deaths are recorded. Despite underreporting, COVID-19 has been less impactful overall in much of Africa, probably due to younger and less-dense populations.

The most extraordinary technical innovation for controlling COVID-19 has been the rapid production and deployment of several highly efficacious vaccines. Developed at an unprecedent speed, these vaccines provide the main opportunity for effectively managing COVID-19. Figure 1 shows vaccine coverage in different regions of the world over time. Achieving sufficient vaccination coverage for the global population is an enormous challenge of short- to medium-term (and perhaps long-term) scale. In late 2020 and early 2021, the supply and equitable distribution of vaccines to low-income countries was a major global problem. As of December 2021, more than 55 percent of the world's population had received at least one dose of a COVID-19 vaccine. Israel has already started to provide a fourth dose of the vaccine, a step which many other developed countries are also considering. However, as vaccine supply to low-income countries improves in 2022 and 2023, longstanding challenges of distributing vaccines in communities with constrained cold chains and weak health systems, as well as strong vaccine hesitancy, will persist unless approaches and groups that have supported control measures for other infectious diseases, such as HIV, are mobilized.

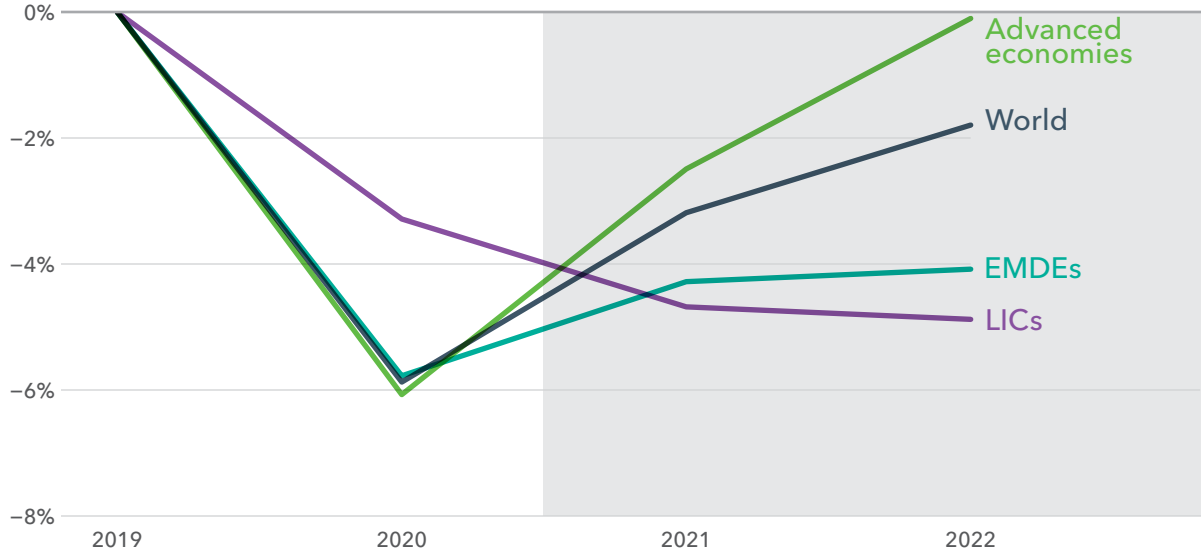
The COVID-19 pandemic has led to social and economic disruptions globally, involving multiple sectors in a manner that is unprecedented in recent times. As noted in our previous volume (Swinnen and McDermott 2020), global GDP initially experienced a dramatic decline that varied across regions. Despite that sharp contraction, the global economy expanded by an estimated 5.9 percent in 2021, based on steady but unequal vaccine coverage (World Bank 2021; IMF 2022). The global recovery remains uneven (Figure 2), with important medium-term implications. While economic output is forecast to exceed pre-pandemic medium-term projections in advanced economies, persistent output losses are anticipated for the emerging market and developing economy (EMDE) group due to slower vaccine rollouts and less robust policy support (IMF 2021). In many poorer countries, per capita income catch-up with advanced economies is expected to slow or even reverse as a result. The

FIGURE 1 Percent of population that has received at least one vaccine dose



Source: Data from Our World in Data (2021).

FIGURE 2 Deviation of output from pre-pandemic projections



Source: Data from World Bank (2021).

Note: Aggregates are calculated using real US dollar GDP weights at average 2010–2019 prices and market exchange rates. The figure shows percent deviation between the June 2021 and January 2020 baseline levels from World Bank projections. The shaded area indicates forecasts. LICs = low-income countries; EMDFs = emerging market and developing economies.

TABLE 1 World outlook growth projections: Real GDP, annual percentage change

	2020	2021 (ESTIMATED)	2022 (PROJECTED)
World	−3.1	5.9	4.4
Advanced Economies	−4.5	5.0	3.9
Emerging Market and Developing Economies	−2.1	6.5	4.8

Source: Data from IMF (2022).

global outlook (Table 1) is optimistic, but remains subject to significant downside risks, which include the possibility of additional COVID-19 waves and financial stress amid high EMDE debt levels (World Bank 2021; IMF 2021).

Research during COVID times

While our previous book focused on the pandemic's many disruptions to food security during the first half of 2020, this book addresses lessons learned in the subsequent 18 months that carry significance for food security and food system resilience.

Since the onset of COVID-19, researchers have rapidly gathered evidence and conducted analyses to determine the impacts of the pandemic and related policies. COVID-19 not only affected the world and the systems studied by IFPRI and colleagues but also the act of conducting research itself. Much of IFPRI's research relies on in-field scientific techniques such as household surveys and field experiments. Obviously these methods of data collection, measurement, and analysis have been constrained by the pandemic. Researchers have had to overcome significant barriers due to public health measures and the risk of infection, which inhibited data collection from in-person surveys and experiments especially.

Researchers have adopted different methodologies for studying the impact of COVID-19 within these constraints, each with its own strengths and weaknesses (Swinnen and Vos 2021). First, a major source of insight has been scenario modeling. This method initially relied heavily on assumptions based on pre-pandemic experiences. Over time, more data have become available, and researchers have been able to improve their results by adjusting their strategies and assumptions. Second, information on policy actions and related data have been easier to collect for analysis than, for example, rural household-level data. For example, the IFPRI Food Trade Policy Tracker, which compiles data on COVID-related trade restrictions, has provided critical macroeconomic insights on food supply. A third approach has been the use of phone surveys to address limitations on researchers in collecting household- and firm-level data. These surveys could be conducted safely and in alignment with social

distancing guidance. However, it is well known that the use of phone survey data poses challenges with sampling and reliability.

Given these strengths and weaknesses, researchers have worked to improve their methodologies and to address specific limitations. Based on increasingly accurate insights and broader coverage of studies, and the combination of different methodologies, this research area has yielded a rich set of insights, on which we draw in this volume.

Organization of the book

In the first section on food security and poverty, we present country-level modeling analyses of food systems, poverty, and diets in 30 countries (Pauw and Thurlow). Adewopo and colleagues show how crowdsourced data can reveal threats to household food security in near real-time. Looking more closely at specific countries, we examine food consumption in Addis Ababa, Ethiopia (de Brauw et al.); demonstrate the impact of falling remittances on Yemen's fragile economy (Elsabbagh et al.); and call for a closer look at food security and nutrition in Guatemala (Ceballos et al.). In Myanmar, Headey and colleagues review evidence on COVID-19's economic impacts, while Ragasa and others examine effects on incomes and livelihoods.

The discussion of agricultural production and value chains begins with an analysis of COVID-19 and food inflation scares from Vos and colleagues. We present a large-scale review of the impacts and actions in agriculture and food supply chains during the pandemic (Place et al.) before discussing resilience-building innovations for supply chains (Reardon et al.). Country-specific chapters focus on the resilience of urban value chains in Ethiopia (Hirvonen et al.); status of India's agrifood supply chains (Narayanan); economic impacts for small and medium enterprises in China (Zhang); effects of the global increase in rice prices for consumers in Papua New Guinea (Schmidt and Dorosh); and varied impacts on Senegal's fruit and vegetable supply chains (Fabry et al.).

In the third section, we discuss the pandemic's effects on nutrition, health, and social programs. Ruel and Headey analyze how the economic crisis created by COVID-19 will adversely impact young children. Country lessons from India assess how to support students and the learning process amid school closures (Pant et al.) and examine disruptions to health and nutrition services in Uttar Pradesh (Nguyen et al.). In Bangladesh, we find that a major food transfer program fell short during the pandemic (Chowdhury et al.). Gilligan and colleagues present lessons on social protection and other specific actions targeted to poor and vulnerable communities in Ethiopia, then Abay and others review how well the country's social safety net limited negative impacts on rural food security. In South Africa, COVID-19 social support programs yielded economic benefits (Gabriel et al.), while in Nigeria, disruptions to school feeding services exacerbated food insecurity (Abay et al.).

The book's final section explores policy responses and implications. McDermott and Reumann present a set of smarter food policy recommendations that are based on the compilation of experiences from the CGIAR COVID-19 Hub over 2020 and 2021. These recommendations are designed to expand coherence with other sectors, consider the needs of vulnerable populations, and strengthen national capacities for policymaking and decisions, particularly those supporting food system resilience. We then review the current state of fiscal and monetary responses to the COVID-19 pandemic

in developing countries, as well as future scenarios (Díaz-Bonilla and Centurion). Andam and Ezekannagha examine country requests for CGIAR support and actions taken in response. Lastly, we examine how trust in science and government plays a crucial role in the pandemic response (Resnick), and discuss how to ensure effective government responses as COVID-19 spreads to rural areas (Kosec and Ragasa).

Impacts of the COVID-19 pandemic on global food security and food systems

As we reflect on the last two years, we find that the experience of the pandemic provides many valuable lessons for food security and the transition to more sustainable, inclusive, and resilient food systems. Some key findings are summarized here, based on the chapters in this book and other new studies.

As was clearly documented in our earlier book — and has since been confirmed by a number of studies — COVID-19 has had significant negative impacts on food security and poverty. However, there is considerable variation among impacts on different social groups. The pandemic disproportionately affected disadvantaged groups such as women, low-skilled workers, and informal workers. The impacts of COVID-19 on income loss differed significantly between sectors and between rural and urban areas. There were more severe employment and income effects for non-agricultural sectors and urban households. However, as rural households are typically poorer than urban households, income loss posed a significant risk for the food security of these households as well. One study estimates the median increase in poverty rates to be between 8 and 9 percentage points, with substantial variation across countries. It suggests that about 65 percent of the increase in poverty has occurred in rural areas (Pauw, Smart, and Thurlow 2021).

The level of disruption to supply chains and trade has varied significantly, depending on the nature of production processes as well as the degree of value chain modernization (Laborde, Martin, and Vos 2020; Ramsey et al. 2021). For example, labor intensity, farm size, and integration of supply chains were found to be critical to the resilience of the food supply (Laborde, Martin, and Vos 2020; Reardon and Vos 2021). Advice to avoid trade restrictions (Glauber et al. 2020) has largely been followed, which has helped to avoid the supply and price crises experienced in 2007–2009, but trade and market restrictions have adversely affected the food supply. Although global markets for staple crops were well stocked prior to COVID-19, trade restrictions and fears of rising prices negatively affected global prices for these foods as well as markets for perishable foods.

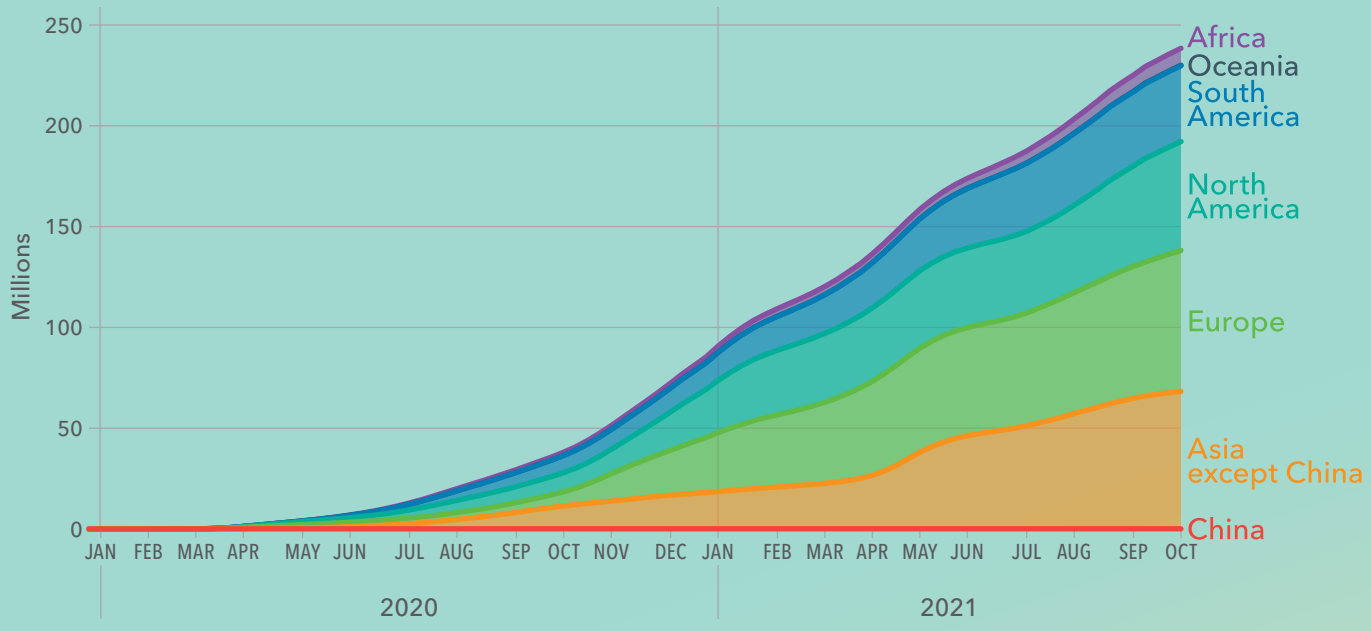
Income loss and supply disruptions have also affected dietary choices, increasing global malnutrition (Headey et al. 2020). Low-income and lower-middle-income households have switched to cheaper and less nutritious foods and reduced their consumption of perishable foods, such as fruits and vegetables. In turn, these shifts have limited their dietary diversity and increased the risk of negative health consequences (Laborde, Martin, and Vos 2020; Ceballos, Hernández, and Paz 2021; Abate, de Brauw, and Hirvonen 2020). One study estimates that an additional 141 million individuals from low- and middle-income countries could not afford a healthy diet in 2020 as a result of COVID-19, and projected that an additional 95 million will not be able to afford it in 2021 amid a slow global economic recovery (Laborde et al. 2021).

Timeline of the global COVID-19 outbreak

- **2019 DEC** — Chinese authorities first inform WHO of pneumonia cases with unknown cause
- **2020 JAN** — China reports first death linked to COVID-19
- **2020 MAR** — Over 100 countries report cases of COVID-19
- **2020 JUN** — Global COVID-19 death surpasses 500 thousand
- **2020 SEP** — Global COVID-19 deaths surpass one million
- **2020 OCT** — IMF predicts a 4.4 percent contraction in global GDP for 2020
- **2020 NOV** — Global COVID-19 cases surpass 50 million
- **2020 DEC** — Delta variant first detected in India; WHO issues its first emergency use validation for a COVID-19 vaccine

Total confirmed COVID-19 cases

Limited testing means that the number of confirmed cases is lower than the actual number of cases.



Source: European Centre for Disease Prevention and Control, Situation Update Worldwide, October 2021.

Global COVID-19 cases surpass 100 million

India halts exports of AstraZeneca vaccine in response to domestic shortages as infections peak at over 26 million cases

Global COVID-19 cases surpass 200 million

30% of the world population has received at least one dose of vaccine

9.23 million doses are administered daily

IMF predicts a 5.9 percent expansion in global GDP for 2021

More than 65% of population are vaccinated in the Americas, and more than 60% in Asia, Europe, and Oceania, and more than 10% in Africa

WHO has approved 10 COVID-19 vaccines

2021 JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 2022 JAN

38% of high-income country populations and 10% of world population have received at least one dose of vaccine

G7 pledges to donate 870 million doses of vaccine, at least half planned for delivery in 2021

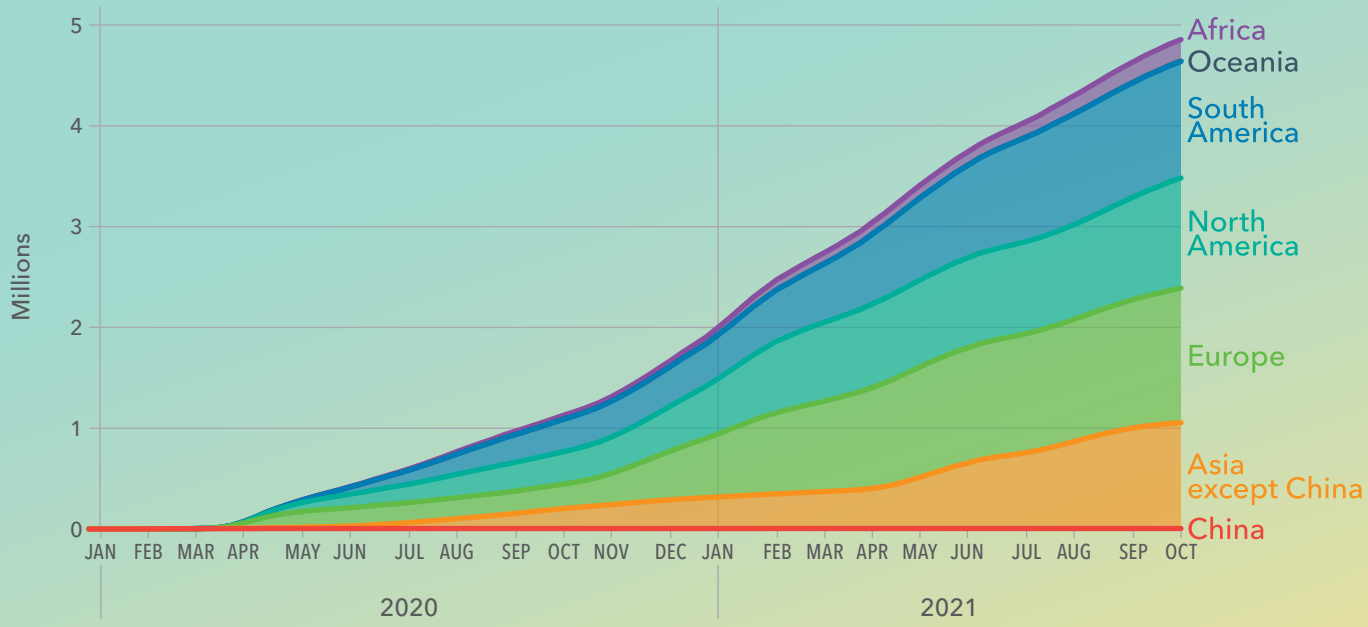
34% of the world population is fully vaccinated, but less than 2.5% in low-income countries

Global COVID-19 deaths surpass five million

Omicron variant first detected in South Africa

Total confirmed COVID-19 deaths

Limited testing and challenges in the attribution of the cause of death mean that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.



Source: European Centre for Disease Prevention and Control, Situation Update Worldwide, October 2021.

Moving forward: Smarter policies for food system resilience

COVID-19 has starkly illustrated the trade-offs between saving lives and supporting livelihoods. Given that increasing food insecurity largely resulted from declines in income, social safety net policies and additional social protection measures should be used to help secure income and access to food. Evidence suggests that cash transfers have important benefits and can induce dietary changes toward more nutritious foods. Due to the limited availability of resources, targeted support is critical to guaranteeing those most in need will benefit. High-income countries and international organizations must provide financial support to poor countries to ensure they can provide adequate safety net programs to their populations.

Disruptions caused by the pandemic have also highlighted the importance of supply chains. As COVID-19 continues to evolve, it is critical that agricultural inputs, food processing, and distribution are not interrupted and can continue with adequate health protocols in place. To protect access to food, incentives and support should be provided to ensure the smooth functioning of food transport and agricultural input markets. In addition, governments should avoid policies that cause further disruption, such as trade restrictions.

The greatest policy successes have resulted from emergency response interventions that build on high-quality existing policies (McDermott, Resnick, and Naylor 2021), highlighting the potential role of existing supportive policy environments for food system resilience. Another major lesson has been the importance of implementing a whole-of-country response — with contributions from a range of public and private sector actors — to address the immediate impacts of the pandemic (see Pauw and Thurlow, in this book). This coordination of food system actors will likewise be needed to foster the resilience of food systems.

The impacts of the pandemic are likely to be felt well into the future, particularly in places where access to health services and vaccination rates are low and new variants are emerging. The pandemic's prolonged and widespread persistence and the continuous evolution of globally important variants such as Delta and Omicron have exposed gaps in our understanding of how to manage longer-term pandemics. The hopeful earlier prediction of linear progress from emergency to recovery and then to resilience-building must be reconsidered. As one critical pivot, countries must address ongoing and emerging development challenges beyond COVID-19 as they seek to manage a transition from epidemic to endemic COVID.

As the world begins to address the broader implications of the pandemic and its coexistence with other challenges — such as environment, climate change, inequity, and conflict — smarter policies and investments will be needed to steer the recovery toward a sustainable, resilient, and inclusive development path. The short-term environmental implications of the pandemic were initially positive and associated with decreased economic activity (OECD 2021). However, longer-term environmental implications of COVID-19 need further monitoring and assessment, as strong linkages exist between socioeconomic and natural systems (OECD 2021; European Environmental Agency 2021). Ensuring environmental health and sustainable development will be critical to minimize the emergence of new diseases and to protect people and economies.

New ways of thinking and behavior will be required going forward. Smart, efficient, and cross-cutting policies that link health, environmental, social, and financial objectives and contribute to food system transformation are central to a revised approach to food system resilience. Food system transformation and resilience-building cannot be considered in isolation, but must instead intersect with policies that foster economic growth, debt sustainability, inclusiveness, gender mainstreaming, the health of humans and animals, and environmental protection. In recognizing the need for a more systemic approach to food systems, the 2021 United Nations Food Systems Summit provided meaningful opportunities for countries to make progress on transformation by applying lessons learned from COVID-19.

Food system resilience must include efforts to prevent and reduce the impacts of future health, climate, and conflict shocks, among others, that can impact the functioning of food systems. Resilience requires the ability to adapt to the rapidly changing contexts within which food systems operate, including increasing urbanization, income changes, complex supply chains, and natural resource and equity constraints. Adaptive food system monitoring systems are also needed as part of the resilience-building pathway.

Both state and non-state actors have a role in building food system resilience. Policies must therefore be inclusive of all actors by enabling and providing them with space to contribute to food system resilience and transformation. Governments need to develop efficient monitoring and response systems, taking advantage of the advances in digital and communication technologies, whose use has accelerated during the pandemic. These developments can enable them to quickly and effectively intervene when future shocks occur. Efforts must also be made to support the capacity of local actors to implement and benefit from such systems. Given the profound impacts of the pandemic on the poor and vulnerable (Kumar et al. 2021), we expect that funders will initially emphasize inclusive approaches to investing in human capabilities through the social development, health, and education sectors. These human capabilities will be critical investments in building future food system resilience.

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