2. COVID-19 impacts on food systems, poverty, and diets: Lessons learned from country-level analyses

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With the outbreak of COVID-19, governments attempted to contain the spread of the virus by limiting the movement and interaction of people through a variety of measures, including restrictions on domestic and international travel, social distancing, and "lockdowns" that temporarily shut down non-essential businesses (IFPRI 2020). While governments had control over these domestic measures, they could do little to shield economies from disruptions to global trade or declines in foreign investment and tourism. Amid uncertainty about how the pandemic would unfold, IFPRI worked with local partners during 2020 to develop economywide models to analyze the impacts of COVID-19 measures on economic growth, food systems, and livelihoods in approximately 30 countries (Pauw, Smart, and Thurlow 2021). Initially, social accounting matrix (SAM) multiplier models were used to trace quarterly and annual shocks during the 2020 calendar year. The real-time analysis provided by these results could potentially be used by policymakers to inform the design of COVID-19 restrictions (for example, in terms of sector targeting or duration) and remedial measures (such as targeted cash transfers or firm subsidies).

As countries emerge from the slowdown in 2020 and 2021 – while dealing with recurring waves of illness and new restrictions – the research emphasis is shifting to modeling the pandemic's medium-term impacts and the trajectory of recovery using IFPRI's Rural Investment and Policy Analysis (RIAPA) model. The RIAPA model is calibrated to the same SAMs used in the earlier analysis but relaxes many of the restrictive behavioral assumptions of multiplier models that were more appropriate for lockdowns when domestic markets were disrupted or ceased to function (Box 1). RIAPA also allows more flexibility in simulation design as well as a consideration of private sector behavioral responses and public sector policy responses to the pandemic. The model's recursive-dynamic setup further provides a multiyear perspective on the recovery trajectory. This chapter reviews key findings from the multiplier analysis and presents the latest results from the ongoing RIAPA analysis. We showcase our work in three countries: Bangladesh, Kenya, and Nigeria.

COVID-19 had a substantial impact on GDP and livelihoods

IFPRI's multiplier modeling analyses revealed the considerable socioeconomic impacts of COVID-19 restrictions. Within the set of 18 country studies reviewed by Pauw, Smart, and Thurlow (2021), median GDP losses ranged from 6 percent (under a faster recovery scenario) to 8 percent (slower recovery) in 2020. In-country partners worked with IFPRI to design simulations based on information about local social distancing measures and their enforcement. Along with differences in economic structure, this information explains the varied impacts of COVID-19 across countries. For example, annual GDP losses in 2020, measured as a deviation from a hypothetical no-COVID baseline, were estimated at 7.7, 7.5, and 10 percent in Bangladesh, Kenya, and Nigeria, respectively, under the faster recovery scenario (Table 1).

BOX 1 Modeling the impacts of the COVID-19 pandemic

Two types of models were used to measure the impacts of the COVID-19 pandemic. Multiplier models track the spillover effects along and across all supply chains in a country, allowing them to measure how downstream disruptions to restaurants, for example, can have implications for farmers upstream. An important assumption in these models is that resource allocations and utilization rates in an economy are not mediated by market and price adjustments, which was the case during the initial period of the pandemic: demand for many products declined irrespective of price responses. Multiplier models are also easy to implement, so long as their core database – a social accounting matrix (SAM) – is available. With support from CGIAR's Policies, Institutions, and Markets (PIM) program, IFPRI has constructed and maintained SAMs for many developing countries over the last decade, which enabled IFPRI to rapidly respond to governments' need for COVID-19 analysis. IFPRI's country programs and its network of in-country partners, especially within governments, made it possible to enlist the support of local researchers and policymakers within weeks of the initial outbreaks.

Over time, however, the focus of most governments has shifted from anticipating COVID-19 impacts to formulating responses and recovery efforts, and more recently, to reestablishing longer-term policy and investment goals, albeit within the context of persistent COVID-19. As markets resumed traditional functions, the type of model needed to analyze COVID-19's impacts and related policy priorities also shifted. Computable general equilibrium (CGE) models, such as IFPRI's RIAPA model, better capture how markets and price adjustments can help economies adapt to persistent shocks like COVID-19. They are also better able to depict a wider range of policy interventions. Long-standing investments in RIAPA by PIM and other donor partners made it possible for IFPRI to continue to engage governments, even as their focus shifted.

TABLE 1 Modeled and official GDP: Deviation from no-COVID baseline and year-on-year growth

	DEVIATION FROM HYPOTHETICAL NO-COVID BASELINE (%)					YEAR-ON-YEAR GDP GROWTH RATES (%)	
	Q1	Q2	Q3	Q4	YR	Pre-COVID projection	Growth outturn
Bangladesh							
Simulated	−2.5	−23.7 to −27.5	−4.7 to −8.6	0.0 to −5.7	−7.7 to −11.1		−1.1 to −4.7
Official	n/a	n/a	n/a	n/a	−3.4	7.2	3.5
Kenya							
Simulated	−4.0	−18.6 to −19.8	−5.0 to −13.1	−1.8 to −2.8	−7.5 to −10.0		−1.9 to −4.6
Official	−0.8	−10.8	−7.6	−4.5	−5.9	6.0	−0.3
Nigeria							
Simulated	−0.5	−32.5 to −36.6	−6.9 to −19.2	−1.3 to −5.2	−10.0 to −15.2		−8.1 to −13.4
Official	−0.1	−8.0	−5.1	−2.0	−3.8	2.1	−1.8

Source: SAM multiplier model results and World Bank (2020b; 2021a).

Note: Simulated results show the range estimated under faster and slower recovery scenarios. The 3.5 percent reported GDP growth for Bangladesh is for the financial year ending June 2021. Adjusting our results to the financial year would imply growth of 0.2 percent rather than −1.1 percent for the calendar year.

Compared to the pre-COVID growth projections of 7.2, 6.0, and 2.1 percent in Bangladesh, Kenya, and Nigeria (World Bank 2020b), the multiplier model results translated into year-on-year GDP growth rates of −1.1, −1.9, and −8.1 percent under the faster recovery scenario. National accounts data released over the last year now reveal a more positive growth outturn of 3.5, −0.3, and −1.8 percent (World Bank 2021a). In Kenya and Nigeria, where GDP results are reported quarterly, it is evident that the multiplier models especially overstated losses in the second quarter (Table 1).

Why were losses apparently overstated?

First, the simulations assumed that restrictive measures would be implemented as they were designed. Many countries adapted their policy responses over time (for example, to deal with localized outbreaks) or failed to fully enforce policies in rural areas or informal settings, for instance. Second, the extent to which employers would adapt to restrictions was uncertain. Even though the pandemic has persisted longer than the simulations anticipated, many businesses seemingly adapted more quickly than expected to virtual work environments, switching, for example, to home delivery and internet-based services. Although the private sector has not been equally resilient across all countries, its adaptability is a potentially important driver of the recovery that has not been fully explored. Third, the simulations considered only the adverse effects of restrictive measures, not the counteracting effects of mitigative measures introduced by governments (many of which were still being developed at the time the analysis was being undertaken). Mitigative measures injected billions of dollars into the economies of Bangladesh (Islam et al. 2020), Kenya (McDade et al. 2020), and Nigeria (Andam et al. 2020) in the form of financial stimulus packages, loan facilities, cash transfers, or food aid.

Fourth, the external shocks factored into the multiplier model simulations were generally less severe than initially anticipated. The World Bank (2020a) projected declines in remittance inflows of more than 20 percent for sub-Saharan Africa (SSA) and South Asia. However, revised estimates show that remittances declined only 12.5 percent in SSA and grew by 5.2 percent in South Asia (World Bank 2021b). Although the 34.7 percent decline in global foreign direct investment (FDI) in 2020 (UNCTAD 2021) was consistent with initial expectations (UNCTAD 2020), the decline was heavily skewed toward developed economies: FDI in SSA declined only 11.7 percent, while FDI in South Asia grew 20.1 percent. Initial tourism projections, on the other hand, were accurate. Tourist numbers declined 63 percent in SSA and 70 percent in South Asia (UNWTO 2021), which was within the range of early projections (58–78 percent) (UNWTO 2020).

Fifth, economic accounting practices may differ between countries, especially in accounting for labor productivity losses associated with work-from-home measures, among others. School closures, for example, would render teachers unproductive if online learning were not possible. In principle, this should have been recorded as a decline in value added — as was done in the multiplier analysis — but if teachers' wages continued to be paid, national accountants may have decided to record this as value added, with no reported loss in GDP. National accounts data from our case study countries reveal interesting differences, even though all three countries closed schools in March 2020. Nigeria reported a 56.2 percent year-on-year decline in education GDP in the second quarter (NBS 2021) and Kenya reported a 24.1 percent decline (KNBS 2021). In contrast, Bangladesh reported growth of more than 5 percent for the calendar year (quarterly results are not reported) (BBS 2021). These results are

not correlated with the internet penetration rates of 34, 23, and 13 percent in Nigeria, Kenya, and Bangladesh, respectively (World Bank 2021c), which serve as a good proxy for how easily countries can shift to online learning. A reasonable deduction is that accounting of value addition indeed differs between these countries.

Agrifood system resilience proved to be important

Although overall losses were likely overstated, IFPRI multiplier analysis offered two important insights critical to shaping the early narrative around COVID-19 impacts. The first relates to the careful accounting of relative sectoral impacts. The multiplier models consistently showed that wholesale and retail trade, transport, and hospitality sectors would be affected most by the pandemic. Given their size, these sectors also contributed most to overall GDP losses. However, the agrifood system (AFS), which consists of primary agriculture, agro-processing, food trade and transport, and food services (such as hotels and restaurants), was relatively less affected (Table 2). This reflects the fact that agricultural production and food processing were generally exempted from COVID19 restrictions, even though disruptions to food supply chains (due to restrictions on movement of people and goods, for example) and restrictions on the hospitality sector did have some direct or indirect effects on the AFS (Pauw, Smart, and Thurlow 2021). Findings on the relative sectoral impacts of COVID-19 have largely been validated by national accounts data so far (BBS 2021; KNBS 2021; NBS 2021).

Table 2 presents multiplier model results from the fast recovery scenario. The AFS accounts for approximately 30 percent of GDP in Bangladesh and Nigeria, and almost 50 percent in Kenya. AFS losses range from −1.8 percent in Bangladesh to −3.8 percent in Kenya and −4.4 percent in Nigeria. These losses contribute as little as 7.1 percent to overall GDP losses in Bangladesh but 24.7 percent in Kenya, where the sector is relatively larger. These results imply that concerns around food security during the pandemic were more directly linked to the loss of household income than to the availability of food. The AFS proved to be not only more resilient than nonfood sectors during the COVID-19 pandemic, but also an important safety net for the overall economy and population.

TABLE 2 Agrifood system impacts: Deviation from no-COVID baseline and contribution to overall GDP losses (faster recovery scenario)

	BANGLADESH			KENYA			NIGERIA		
	Initial GDP share	Dev. from base	Contr. to change	Initial share	Dev. from base	Contr. to change	Initial share	Dev. from base	Contr. to change
Agrifood system	29.9	−1.8	7.1	49.0	−3.8	24.7	32.6	−4.4	14.4
Agriculture	14.1	−0.8	1.5	37.2	−3.0	15.1	21.0	−3.3	6.9
Agro-processing	2.4	−3.2	1.0	3.7	−1.7	0.9	4.0	−7.4	3.0
Food trade & transport	12.2	−1.8	2.9	7.3	−6.5	6.4	6.7	−4.5	3.0
Food services	1.0	−12.2	1.7	0.8	−21.5	2.4	0.9	−17.5	1.5

Source: SAM multiplier model results.

Note: All figures in percentages; dev. = deviation; contr. = contribution.

Rural (and poor) households were less exposed to shocks

The second important insight relates to poverty and the distributional effects of COVID-19. The pandemic had a significant impact on household livelihoods, with incomes falling by roughly the same magnitude as GDP losses. However, in most countries, COVID-19 policy design and enforcement meant that rural and poor households' incomes were less affected than the incomes of urban and nonpoor households. In Kenya, for example, income losses among rural households were only 48.4 percent that of urban households (Table 3). Despite lower income losses, however, between 41.9 and 69.3 percent of people pushed into poverty during the second quarter of 2020 in these three countries live in rural areas. Across the 18 countries surveyed by Pauw, Smart, and Thurlow (2021), between 42 and 93 percent (67 percent average) of people pushed into poverty were in rural areas. Kenya and Nigeria are therefore at the lower end of the range.

In short, the COVID-19 pandemic made all households worse off, but it narrowed the income gap between urban and rural and between poor and nonpoor households, resulting in lower inequality. However, this finding does not justify excluding rural households from government support measures during the recovery phase. In most countries – Kenya and Nigeria being exceptions – most people who became poor during the pandemic are rural, which highlights the increased vulnerability of rural households to shocks. It may also take much longer for poor and/or rural households to recover from shocks.

Medium-term impacts and recovery

Whereas the multiplier analysis proved useful for analyzing the structural and distributional effects of COVID-19 in the short term, the RIAPA model is now being used to analyze medium-term impacts, the economic recovery, and outcomes under alternative policy and investment scenarios. Since the RIAPA model relaxes some of the most restrictive assumptions of multiplier models – most notably the assumption of fixed relative prices – the implications of COVID-19 for poverty and diet outcomes can be studied more carefully.

TABLE 3 Household income and poverty effects (faster recovery scenario)

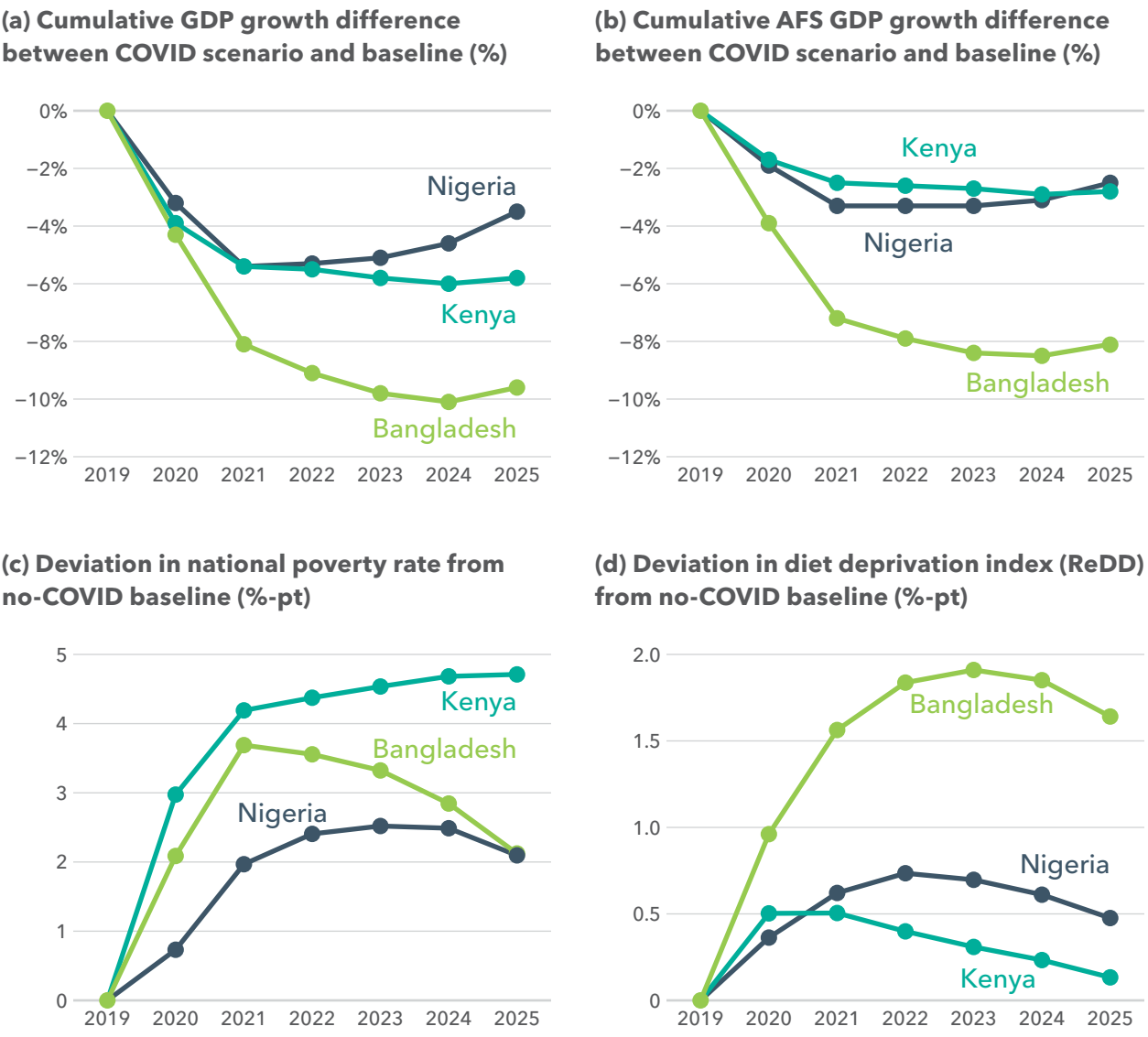
	RATIO OF RURAL TO URBAN INCOME LOSS (%)	RATIO OF POOR TO NON-POOR INCOME LOSS (%)	POVERTY RATE PRE-COVID (%)			CHANGE IN POVERTY (Q2 2020) (PERCENTAGE POINTS)			RURAL SHARE OF POOR (PRE-COVID)	RURAL SHARE OF NEWLY POOR
			All	Urban	Rural	All	Urban	Rural		
Bangladesh	81.9	89.1	24.7	19.1	26.8	8.5	9.5	8.1	79.0	69.3
Kenya	48.4	59.7	36.1	29.1	40.1	5.8	9.1	3.8	71.1	41.9
Nigeria	69.1	66.0	53.4	29.6	66.6	4.5	6.8	3.3	80.2	47.1

Source: SAM multiplier model results.

Note: Poverty changes reported are for the second quarter of 2020 when COVID-19 restrictions were at their most stringent. These poverty results have been adjusted to account for the overestimation of GDP losses in the multiplier model (see Table 1).

As with the multiplier analysis, simulation results are compared against a hypothetical no-COVID baseline. Figure 1 presents preliminary results for Bangladesh, Kenya, and Nigeria. The COVID-19 scenario is based on the World Bank (2021a) GDP results for 2020 and projections for 2021 onward, released in June 2021. A further adjustment is made for the negative impact of the SARS-CoV-2 Delta variant, which had not yet been factored into the World Bank projections at the time.

FIGURE 1 Selected results from RIAPA COVID-19 modeling: GDP, agrifood system GDP, poverty, and diet deprivation



Source: RIAPA model results.

Panels (a) and (b) in Figure 1 present cumulative differences in the year-on-year growth rates in GDP and AFS GDP between the COVID-19 scenario and the no-COVID baseline. Although differences in growth rates are similar in 2020 across the three countries, the World Bank (2021a) projects a much quicker recovery for Kenya and Nigeria from 2021 onward, resulting in much higher cumulative losses in Bangladesh over the 2020–2025 analysis period relative to the baseline. Consistent with earlier SAM multiplier results, AFS GDP losses are smaller than national GDP losses.

Panel (c) presents deviations in poverty rates. Although the modeling shows that poverty rates start recovering after their peak in 2020, the gap between baseline and COVID-19 poverty rates continues to grow in 2021, and beyond that in Kenya and Nigeria. This reflects the lasting impact of large income losses in 2020 on current investment and hence the future earnings potential of households.

Panel (d) presents changes in the Reference Diet Deprivation (ReDD) index, a multidimensional indicator of consumption gaps across main food groups (staples, fruits, vegetables, dairy, protein foods, and added fats) (Pauw, Ekert, et al. 2021). An increase in ReDD indicates deteriorating diet quality. ReDD is influenced by changes in disposable income and relative food prices, which affect the real cost of a healthy diet. Decomposition of RIAPA results reveals that while COVID-19 generally causes the price of foods to decline relative to non-foods – due to the food sector's exemption from restrictions – household income losses dominate and cause diet quality to worsen relative to the no-COVID baseline.

Future analysis

RIAPA results presented here are preliminary and subject to change as new information becomes available about domestic and global impacts. The model is also designed to easily incorporate the effects of new waves of the pandemic, such as the new SARS-CoV-2 Omicron variant. The focus of future work will also be on the economic recovery. Here the interest is in both the "private" and "public" drivers of recovery. The adaptability of the private sector to new business and policy environments is a potentially important driver of the recovery. Understanding the endogenous behavioral responses of businesses and exploring how these can be better captured in RIAPA will be an important focus of future work.

Future analysis will also be geared toward informing government policy and investment options that can help shape the pace and nature of the recovery, while recognizing that government ambitions in this regard may be severely curbed by high levels of post-pandemic debt and revenue shortfalls. Even though results consistently highlight that the AFS has been relatively less affected by COVID-19 restrictions, the sector has played an important role in providing a safety net for the overall economy and population. As such, investments in the AFS should continue to be prioritized as a cornerstone of the recovery strategy.

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