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COVID-19 shock, social protection and food insecurity in Nigeria: A difference-in-difference approach

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Abstract

This paper assesses the effects of social protection interventions in mitigating the COVID-19 shocks on household food insecurity in Nigeria. It employs the World Bank Living Standards Measurement Study for Nigeria, focusing on the dataset collected before the COVID-19 shock and during a post-COVID-19 phone survey. A difference-in-difference approach was used to explore the heterogeneous effects of social protection on all the individual measures of food insecurity across the gender of the recipient, household location and wealth status. The results show that food insecurity was greater in all households after the pandemic shock. Social protection measures were effective in mitigating the effects of the pandemic, and these effects were greater for cash assistance. The mitigating effect was greater among female-headed households, poor households, those in rural areas and those involved in farming. The findings of this study highlight the need for a well-organised social protection programme. In particular, policies aimed at promoting cash assistance among female-headed households, poor individuals, those in rural areas and those involved in farming can have important implications for improving the food security of households in Nigeria.

Key words: COVID-19, food insecurity, social protection, Nigeria

1. Introduction

Emerging from China in December 2019, the COVID-19 pandemic stressed the interconnection between public health, food security, poverty and social protection worldwide, and especially in

Africa (Evans 2020; Mahler *et al*. 2020; Nonvide 2020a, 2020b; Valensisi 2020; Chabossou *et al*. 2021). Andam *et al*. (2020) and Amare *et al*. (2021) reported that lockdowns in Nigeria caused a 34.1% loss in GDP (USD 16 billion), driven heavily by service sector losses, and a 14% increase in the poverty rate. According to them, households faced a 33% average income reduction, with widespread food insecurity and reduced nonfarm employment, particularly affecting vulnerable populations. COVID-19 affects food security through two pathways. First, health and productivity losses hurt household welfare. Second, government restrictions (mobility restrictions, lockdowns and social distancing measures, among others) reduce economic activity and income, directly worsening access to food.

Despite relying on social protection to mitigate the effect of COVID-19 on food security, the coverage remained critically low in Nigeria. Only 21% of Nigerians benefited, including 3% from social insurance and 17% from safety nets (World Bank 2022). Between 2020 and 2021, government aid reached a few households through cash (4%), in-kind (3%) or food transfers (15%), proving insufficient against rising poverty (Lain & Vishwanath 2021). Although there is broad agreement that social protection is essential, the relative effectiveness of cash transfers and food assistance remains debated. Several studies argue that the choice of intervention should depend on market conditions, institutional capacity, infrastructure and the nature of the crisis (Kebede 2006; Cunha 2014). While many studies conclude that cash transfers are more cost-effective and often preferred by beneficiaries because they improve food consumption and dietary diversity (Alam 2020; Jerving 2020; Abay *et al*. 2021, 2023), others show that food transfers perform better during humanitarian emergencies and in areas with disrupted markets (Hoddinott *et al*. 2014; Egbetokun *et al*. 2021).

The aim of the present study was to assess the effectiveness of social protection in mitigating the effect of COVID-19 shocks on the food insecurity status of households in Nigeria. The case of Nigeria is very interesting for several reasons. First, Nigeria relies heavily on international markets, therefore disruptions in these markets would severely affect food security conditions in the country. Second, before the COVID-19 crisis, the country experienced high rates of food insecurity and poverty, as more than 40% (approximately 83 million) of the population was poor (Amare *et al*., 2021). Therefore, the COVID-19 crisis worsened the food insecurity situation in the country.

Our study adds knowledge to the literature in several ways. First, although numerous studies (Andam *et al*. 2020; Balana *et al*. 2020; Abay *et al*. 2021; Akim *et al*. 2021; Amare *et al*. 2021; Martinez 2021; Balana *et al*. 2023; Akim *et al*. 2024) have analysed the impact of COVID-19 and related measures on food security in Nigeria, the role of social protection has not yet been analysed sufficiently. The exception is the work of Egbetokun *et al*. (2021). However, by estimating a panel logit model, Egbetokun *et al*. (2021) fail to quantify the real impact of social protection measures in mitigating the impact of COVID-19 on household welfare. Indeed, social protection acts as a stabiliser by helping to maintain a minimum level of purchasing power and therefore preventing demand from dropping sharply. It helps to maintain household consumption such that people are able to overcome the risk of poverty and social exclusion.

Therefore, our study helps to fill this gap by analysing the effectiveness of the social protection measures implemented in response to the COVID-19 shock. Second, the study employed a rigorous method of analysis – a difference-in-differences (DiD) approach. As pre-pandemic data are available, the DiD approach helps to investigate whether food insecurity in a household would have evolved in tandem in the absence of social protection. Third, given that it is well understood that some households may not be able to capitalise on social protection measures, we also analysed the distributional effects of social protection across gender, household location and wealth status. A disaggregated analysis allowed us to identify who benefits more from social protection measures.

Fourth, the results of this study are important for formulating social protection-related policies for vulnerable households to moderate the negative effects of COVID-19 on food insecurity.

2. Methodology

2.1 Data description

This study uses the World Bank's Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) data for Nigeria, comparing the pre-COVID-19 face-to-face GHS survey (2018/2019, wave 4) with 12 rounds of the post-COVID-19 national phone survey (NLPS – 2020). The nationally representative 2018/2019 GHS panel surveyed 4 976 households across Nigeria's six geopolitical zones, covering both the post-planting (July to September 2018) and post-harvest (January to February 2019) periods. This two-wave structure ensures comprehensive agricultural and household data. The COVID-19 NLPS-2020 sample is drawn from the 2018/2019 GHS (wave 4). Among the 4 976 households interviewed in the 2018/2019 GHS (wave 4) postharvest survey, 3 000 households with telephone numbers were randomly selected for the 12 rounds of the COVID-19 NLPS-2020 survey, and 1 950 households completed the phone interviews from the first round. The National Bureau of Statistics (NBS) calculated and applied appropriate sampling weights to control for selection bias related to nonresponse and potential attrition in a phone survey, which was necessary to construct a nationally representative sample.

We leveraged the extensive information collected in the 2018/2019 GHS (wave 4) survey, which was just over a year prior to the COVID-19 pandemic, to assess the differential impacts of the COVID-19 shock on households in Nigeria. We focus on measures of food security, social protection and other relevant variables measuring various household characteristics.

We checked for non-random attrition by comparing household characteristics across the 2018/2019 GHS (wave 4) and the first two rounds of the COVID-19 NLPS-2020 survey. The sampling weight calculations revealed that the 1 950 fully interviewed households (from the second round) were similar to the 3 000 initially randomly selected households (see National Bureau of Statistics & World Bank, 2020:9 for more details). We generated a binary variable, the attrition dummy, which equals 1 if a household is absent in a round; otherwise, the household is present. Then, we calculated the attrition rate across waves and found that approximately 90% of all households interviewed in the first round of the post-COVID-19 survey were present in subsequent rounds (see Appendix 1). However, we use the inverse probability weighting (IPW) methods recommended by Verbeek and Nijman (1992), Foster and Bickman (1996) and Amolegbe *et al*. (2021) to test for attrition bias and correct for attrition in our analysis.

2.1.1 Food insecurity status

Our outcome variable is household food insecurity, and we focused on the eight indicators (measures) of hunger and food shortage based on self-reported data collected from households in the preceding 30 days (Hoddinott 1999). Following Amare *et al*. (2021), we used principal component analysis (PCA) to construct a composite index of food insecurity to complement the eight indicators and check for differences in the results based on differences in measurements. We also included the sum of all the food indicator (dummy variable) measures as a simple count variable and measure of the food insecurity score. Akim *et al*. (2024) did the same using a reduced food insecurity experience scale (FIES).

2.1.2 Social protection

To measure household access to social protection, we focused on two measures: (1) the yes/no questions if any household member received any assistance from any institution, such as an international organisation, government or religious body; and (2) the yes/no questions if any household member received cash or food assistance. However, we did not add the value of assistance because there is no complete information on value in the post-COVID-19 survey. Based on this information, we aggregated at the household level and defined groups following two steps. In the first step, we defined four subgroups.

- Group 1 included households with no social protection beneficiary member during the pre-COVID period.
- Group 2 included households with any social protection beneficiary member during the pre-COVID-19 period.
- Group 3 included households with no social protection beneficiary member during the post-COVID period.
- Group 4 included households with any social protection beneficiary member during the post-COVID-19 period.

In the second stage, we dropped "Group 2" and defined two final groups containing the remaining three subgroups (Group 1, Group 3 and Group 4). First, we defined the "non-beneficiary social protection" group as households belonging at the same time to "Group 1" and "Group 3", i.e., households with no social protection beneficiary members during the pre- and post-COVID-19 periods. Second, "beneficiary social protection" is defined as "Group 1" or "Group 4". This group included households with no social protection beneficiary members before COVID-19 but beneficiaries during the post-COVID-19 period. To understand the heterogeneous impacts of social protection, we further considered beneficiary and non-beneficiary groups for each type of social protection received by households (cash and food assistance).

2.2 Estimation strategy

To assess the effect of COVID-19 shocks on the food insecurity status of households and the mitigating role of social protection in Nigeria, this study used a difference-in-differences (DiD) approach. The DiD approach is based on the fundamental assumption of a parallel trend, meaning that food insecurity in a household would have evolved in tandem with the absence of social protection (Akim *et al*. 2021). Therefore, we assumed that, in the absence of the pandemic, the food insecurity status of beneficiaries and non-beneficiary households receiving social protection would follow similar trends. Given that this counterfactual situation is unobservable, we conducted a validity check that compared the food insecurity trends among beneficiary and non-beneficiary households prior to the pandemic shock, as proposed by Akim *et al*. (2021, 2024).

Our difference-in-differences (DiD) strategy is specified as in Equation (1) below:

$$y_{ht} = \beta_0 + \alpha_h + \beta_1 Post_t + \beta_2 SP_h + \beta_3 SP_h * Post_t + \mu_{ht}, \quad (1)$$

where y_{ht} represents the food insecurity outcome (each indicator) of household h in round t. α_h represents time and household fixed effects, which capture all time-invariant differences between beneficiary and non-beneficiary households. $Post_t$ is a dummy variable taking the value 1 for the post-COVID-19 rounds and 0 for the pre-COVID-19 round. SP_h is a dummy indicating whether the household is a beneficiary or non-beneficiary of social protection. Thus, the social protection variable

takes the value 1 if household h received any assistance (beneficiary) and 0 otherwise (non-beneficiary). The coefficient β_3 is the parameter of interest, and this coefficient is expected to be negative. μ_{ht} is the error term, and β_0 is the constant term.

As we focused on the household, and following Ibukun and Adebayo (2021), we controlled for variations in the sociodemographic and socioeconomic characteristics of households. The variables included age of the head, gender of the head, household size and rural status.

We took into account the heterogeneity effect across beneficiaries' and non-beneficiary households' food insecurity status. Therefore, we run our specifications in Equation (1) for dimensions such as area of residence (urban, rural), the gender of a beneficiary household member, farming household, household wealth status and type of social protection. We estimate the effect through the average treatment effect on treated individuals (ATET), as we are interested in the average of the individual treatment effects of those benefiting from social protection during the COVID-19 pandemic.

To remove the bias potentially created by attrition and the correlation between the observables in our panel, we first ran the linear probability regression of the attrition determinants. Appendix 2 shows that area of residence (rural), household wealth (non-poor) and household farming status (farming households) are the determinants of attrition. Then, we predicted attrition bias, corrected it using weight and included the weighted inverse as a control variable in our DiD regression. This allowed us to control for sampling error that the estimated attrition would cause. Meng *et al*. (2016) state that the sampling error of estimated regressors deserves consideration and to be account for, as this could contaminate the estimates.

3. Results and discussion

3.1 Descriptive statistics

Table 1 presents the descriptive statistics of the key variables before (wave 4) and after (the whole sample) COVID-19. The results indicate a non-significant difference in terms of household characteristics between pre-COVID-19 and post-COVID-19. Approximately 19% of the households were female headed, and 61% were in rural areas. On average, household heads were 50 years old, while household members were 28 years old on average. The proportion of households that received cash as a form of assistance was the largest (14.36%) of the three forms of assistance post-COVID-19. Across all eight food insecurity variables, we found a significant difference between the pre-COVID-19 and post-COVID-19 data. Indeed, the proportion of food-insecure households increased significantly with the COVID-19 pandemic. "Not quality food" was the major food insecurity status of households before (42.15%) and after (89.64%) the pandemic.

Table 1: Summary statistics of key variables

	Pre-COVID		Post-COVID		t-test difference	
	Mean	**Std dev.**	**Mean**	**Std dev.**		
Household characteristics						
Rural (%)	61.38	48.70	61.28	48.72	0.10	-0.07
Female headed (%)	19.49	39.62	18.00	38.43	1.49	-1.19
Age of head (years)	49.73	14.85	50.22	14.51	-0.49	(-1.05)
Mean age in household	27.55	13.15	27.48	12.77	6.48	-0.16
Household size	5.85	3.52	6.07	3.60	-0.21	(-1.87)
Food insecurity measures (%)						
Skip	26.00	43.87	72.77	44.53	-0.468***	(-33.04)
Exhaust	25.08	43.36	56.82	49.55	-0.317***	(-21.29)
Starve	4.62	20.99	24.41	42.97	-0.198***	(-18.28)
Not enough	37.03	48.30	83.95	36.72	-0.469***	(-34.15)
Not quality	42.15	49.39	89.64	30.48	-0.475***	(-36.13)
Little food	40.41	49.08	88.00	32.50	-0.476***	(-35.70)
Ate less	34.77	47.64	85.74	34.97	-0.510***	(-38.09)
Hungry	19.08	39.30	73.33	44.23	-0.543***	(-40.49)
Assistance (%)						
Cash	2.26	14.85	14.36	35.08	-0.121***	(-14.03)
Food	6.72	25.04	2.26	14.85	0.0446***	-6.77
N	1950		1950		3900	

Notes: post-COVID-19 means post-COVID-19 lockdown; *** = $p < 0.01$
Source: Authors' calculations using the LSMS-ISA dataset

Table 2 presents the characteristics of the two groups of households – beneficiaries and non-beneficiaries – before the pandemic. Overall, in terms of characteristics, households were similar in terms of rural residency, farming, non-farming and wage activities. Differences can be observed in their size, age of the head and share of female-headed households. When disaggregating by type of social protection, only households from the food assistance group were similar in terms of all characteristics. Regarding food insecurity outcomes, there was a difference between groups in terms of food insecurity, except for three indicators (exhaust, starve, and not quality). As for household characteristics, there was no difference between households in the food assistance group, and the difference was driven by cash assistance.

Table 2: Household characteristics at baseline (pre-COVID-19)

		Social protection (SP)		Cash assistance		Food assistance		Difference test		
	Aggregate	Treated	Control	Treated	Control	Treated	Control	Any SP	Cash	Food
Household characteristics										
Rural (%)	60.03	59.84	60.11	60.98	61.75	64.58	59.66	0.002	0.007	-0.049
Female headed (%)	20.12	24.61	18.33	24.51	17.77	20.83	19.97	-0.062**	-0.067**	-0.008
Age of head (years)	49.73	51.39	49.07	51.57	49.08	48.98	49.76	-2.325**	-2.488**	0.78
Mean age	28.00	30.29	27.09	29.99	26.70	27.05	28.03	-3.197***	-3.292***	0.974
Household size	5.66	5.18	5.85	5.34	6.01	5.73	5.68	0.664***	0.675***	-0.051
Farming (%)	83.53	84.45	83.16	85.49	84.31	87.50	83.17	-0.012	-0.011	-0.043
Non-farming (%)	83.75	83.66	83.79	84.12	84.03	88.54	83.52	0.001	-0.000	-0.050
Wage (%)	46.26	48.62	45.32	49.80	44.91	51.04	46.14	-0.033	-0.048	-0.049
Assistance (%)										
Cash	0.00	0.00	0.00	0.00	0.00	10.42	1.74	0	0	-0.086***
Food	0.00	0.00	0.00	7.06	6.52	0.00	0.00	0	-0.005	0
Food insecurity (%)										
Skip	26.25	32.68	23.68	32.55	23.64	33.33	25.83	-0.090***	-0.089***	-0.075
Exhaust	24.90	26.38	24.31	26.86	24.36	29.17	24.78	-0.020	-0.025	-0.043
Starve	4.50	4.33	4.56	3.92	4.66	9.38	4.41	0.002	0.007	-0.049*
Not enough	37.44	42.72	35.33	42.35	35.03	39.58	37.32	-0.073**	-0.073**	-0.022
Not quality	41.54	45.08	40.13	45.69	40.76	45.83	41.38	-0.049	-0.049	-0.044
Little food	40.42	45.28	38.47	45.69	38.54	46.88	39.99	-0.068**	-0.071**	-0.068
Ate less	34.91	39.57	33.04	40.20	32.74	40.63	34.59	-0.065**	-0.074**	-0.060
Hungry	19.34	23.03	17.86	22.75	17.62	25.00	19.09	-0.051*	-0.051*	-0.059
Food insecurity index										
Food index	-49.80	-0.40	-0.54	-0.40	-0.54	-0.37	-0.50	-0.137**	-0.140**	-0.136
Food count	2.29	2.59	2.17	2.60	2.17	2.70	2.27	-0.417**	-0.427**	-0.424
N	1779	508	1271	510	1396	96	1723	1779	1906	1819

Note: *** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$

Source: Authors' calculation using the GHS-Panel wave 4

3.2. Effects of COVID-19 and social protection on household food insecurity status

Tables 3, 4 and 5 present the effects of COVID-19 and social protection on household food insecurity. Table 3 shows that COVID-19 significantly increased household food insecurity across all eight indicators, with the strongest effect observed for the composite food insecurity index. The pandemic substantially increased the proportions of households skipping meals, running out of food, going an entire day without eating and experiencing hunger. Household size also exacerbated food insecurity for most indicators. These findings are consistent with previous evidence from Nigeria (Balana *et al*. 2020; Inegbedion 2020; Abay *et al*. 2021; Amare *et al*. 2021; Martinez 2021) and other developing countries (Arndt *et al*. 2020; Elsahoryi *et al*. 2020; Kayiira 2021; Nguyen *et al*. 2021), confirming that the pandemic significantly worsened food insecurity. The results further indicate that social protection mitigated the adverse effects of COVID-19, with significant reductions observed across all food insecurity indicators, particularly for households that skipped meals or experienced starvation. These findings support those of Egbetokun *et al*. (2021) and Abay *et al*. (2023), who also documented the positive role of social protection in improving household food security during the pandemic.

Tables 4 and 5 distinguish the effects of cash and food assistance. The interaction between COVID-19 and each type of assistance reveals that, although food insecurity increased among both beneficiary groups during the pandemic, cash transfers provided a substantially stronger mitigating effect than food assistance. While food assistance reduced food insecurity for only a limited number of indicators, cash assistance consistently lowered household food insecurity, with the difference-in-differences estimates showing a reduction of 8.7 percentage points for the food insecurity index, compared with only 0.5 percentage points for food assistance. Despite the relatively modest transfer amounts received by households, cash assistance appears to have been the most effective form of social protection because it enabled beneficiaries to purchase more diversified foods according to their needs and preferences. These findings are consistent with previous studies highlighting the effectiveness of cash transfers in reducing food insecurity in Nigeria (Babatunde & Olagunju 2020; Egbetokun *et al*. 2021), India (Jerving 2020), Zambia (Paul *et al*. 2021) and Ethiopia (Abay *et al*. 2023).

Table 3: Effects of COVID-19 and social protection (cash or food assistance) on household food insecurity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	**Skip**	**Exhaust**	**Starve**	**Not enough**	**Not quality**	**Little food**	**Ate less**	**Hungry**	**Food index**	**Food count**
Female headed	0.119	0.155	0.263	0.175	0.194*	0.183	0.135	0.189	0.517	1.629
	(0.069)	(0.153)	(0.081)	(0.035)	(0.023)	(0.102)	(0.035)	(0.061)	(0.161)	(0.511)
Head age	-0.002*	-0.005	-0.005	-0.005	-0.004	-0.002**	-0.005	-0.003***	-0.010	-0.032
	(0.000)	(0.003)	(0.002)	(0.001)	(0.002)	(0.000)	(0.003)	(0.000)	(0.002)	(0.008)
Household size	0.022	0.023**	0.036**	0.028*	0.038*	0.033**	0.028*	0.021*	0.080***	0.250***
	(0.004)	(0.001)	(0.001)	(0.004)	(0.005)	(0.002)	(0.004)	(0.002)	(0.001)	(0.001)
Covid	0.619***	0.565***	0.422***	0.404***	0.407**	0.405***	0.452***	0.481***	1.053***	3.279***
	(0.004)	(0.002)	(0.003)	(0.004)	(0.007)	(0.001)	(0.000)	(0.002)	(0.002)	(0.006)
Social protection*Covid	-0.072***	-0.044***	-0.062***	-0.029***	-0.027***	-0.021***	-0.018**	-0.012**	-0.084***	-0.267***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
Constant	0.236	0.345	0.041	0.412	0.370	0.288**	0.426	0.194*	-0.550	2.142*
	(0.055)	(0.106)	(0.138)	(0.077)	(0.130)	(0.006)	(0.126)	(0.029)	(0.088)	(0.267)
Observations	3 557	3 557	3 557	3 557	3 557	3 557	3 557	3 557	3 557	3 557

Notes: Estimations were adjusted for covariates, panel effects and time effects, and controlled for predicted weighted attrition. Robust standard errors in parentheses.
*** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$
Source: Authors' calculation using the LSMS-ISA dataset

Table 4: Effects of COVID-19 and cash assistance on household food insecurity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	**Skip**	**Exhaust**	**Starve**	**Not enough**	**Not quality**	**Little food**	**Ate less**	**Hungry**	**Food index**	**Food count**
Female head	0.113	0.149	0.285	0.176	0.171	0.205	0.156	0.188	0.510	1.609
	(0.102)	(0.173)	(0.095)	(0.070)	(0.029)	(0.109)	(0.051)	(0.088)	(0.191)	(0.605)
Head age	-0.002	-0.004	-0.006	-0.004	-0.003	-0.002	-0.005	-0.003*	-0.008	-0.027
	(0.001)	(0.003)	(0.001)	(0.002)	(0.002)	(0.000)	(0.004)	(0.000)	(0.004)	(0.013)
Household size	0.023*	0.023**	0.035**	0.026*	0.032*	0.031***	0.028	0.022**	0.076***	0.240***
	(0.003)	(0.001)	(0.002)	(0.003)	(0.004)	(0.000)	(0.005)	(0.001)	(0.000)	(0.002)
Covid	0.618***	0.566***	0.432***	0.412***	0.408***	0.409***	0.460***	0.494***	1.070***	3.332***
	(0.001)	(0.002)	(0.000)	(0.005)	(0.006)	(0.000)	(0.000)	(0.000)	(0.004)	(0.014)
Cash*Covid	-0.067***	-0.050***	-0.055***	-0.025**	-0.025**	-0.021***	-0.024***	-0.021***	-0.087***	-0.275***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
Constant	0.186	0.300	0.067	0.377	0.350	0.259*	0.387	0.186***	-0.625	1.911
	(0.034)	(0.107)	(0.071)	(0.114)	(0.129)	(0.033)	(0.149)	(0.001)	(0.168)	(0.516)
Observations	3 811	3 811	3 811	3 811	3 811	3 811	3 811	3 811	3 811	3 811

Notes: Estimations were adjusted for covariates, panel effects and time effects, and controlled for predicted weighted attrition. Robust standard errors in parentheses.
*** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$
Source: Authors' calculation using the LSMS-ISA dataset

Table 5: Effects of COVID-19 and food assistance on household food insecurity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	**Skip**	**Exhaust**	**Starve**	**Not enough**	**Not quality**	**Little food**	**Ate less**	**Hungry**	**Food index**	**Food count**
Female headed	0.109*	0.144	0.272*	0.168*	0.184*	0.176**	0.127*	0.179*	0.495**	1.562**
	(0.014)	(0.030)	(0.030)	(0.016)	(0.015)	(0.010)	(0.017)	(0.017)	(0.031)	(0.098)
Head age	-0.003	-0.005	-0.005	-0.005**	-0.004*	-0.002	-0.005*	-0.003***	-0.010**	-0.032**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Household size	0.022*	0.023**	0.037**	0.029***	0.038*	0.033***	0.028**	0.021*	0.080**	0.252**
	(0.002)	(0.001)	(0.001)	(0.000)	(0.003)	(0.000)	(0.001)	(0.002)	(0.002)	(0.006)
Covid	0.600***	0.553***	0.399***	0.394***	0.397***	0.401***	0.446***	0.476***	1.027***	3.195***
	(0.003)	(0.000)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Food*Covid	-0.033***	-0.045***	0.045***	0.014***	0.024***	-0.010***	0.005***	0.020***	-0.005***	-0.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.247	0.356*	0.038	0.415**	0.362**	0.293*	0.429**	0.198**	-0.547**	2.152**
	(0.045)	(0.044)	(0.046)	(0.021)	(0.009)	(0.039)	(0.011)	(0.008)	(0.016)	(0.057)
Observations	3 637	3 637	3 637	3 637	3 637	3 637	3 637	3 637	3 637	3 637

Notes: Estimations were adjusted for covariates, panel effects, and time effects and controlled for predicted weighted attrition. Robust standard errors in parentheses.
*** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$
Source: Authors' calculation using the LSMS-ISA dataset

3.3. Exploring the heterogenous effects

Table 6 reports the heterogeneous effects of social protection on household food insecurity according to household characteristics. The results show that the mitigating effect of social protection, whether provided through cash or food transfers, was stronger for rural households than for urban households, indicating that rural households benefited more during the COVID-19 pandemic. Similarly, female-headed households experienced greater benefits than male-headed households, with significant effects observed across all food insecurity indicators for female-headed households, whereas the effect was insignificant for one indicator (little food) among male-headed households. Table 6 further shows that poor households benefited more from social protection than non-poor households, as significant effects were found for all food insecurity indicators among poor households, while non-poor households did not benefit in terms of access to quality food. These findings are consistent with Abay *et al*. (2023), who reported that the protective effect of participation in Ethiopia's Productive Safety Net Programme was greater for poorer households and those living in remote areas.

Overall, however, the mitigating effect of social protection in Nigeria remains limited. According to the International Monetary Fund (IMF 2020), this limited effectiveness reflects the absence of an adequate institutional framework capable of mitigating the socioeconomic consequences of the pandemic. Although several social assistance programmes had been introduced before COVID-19, their coverage remained very low, with only 4% of households among the poorest 40% benefiting from social safety net programmes (World Bank 2019). Moreover, these programmes suffered from weak targeting and limited effectiveness (IMF 2020), while the distribution of food assistance during the pandemic was undermined by implementation failures and a lack of transparency (Dixit *et al*. 2020).

3.4 Robustness check

We tested the robustness of our results by using an alternative estimation method, ordinary least squares (OLS). We estimated the effects of COVID-19 and social protection (cash or food) to evaluate the changes in the results. Table 7 shows that the results are similar to those of DiD. Indeed, the results show that COVID-19 increased food insecurity for all the indicators and indices (as shown in Table 3). In addition, the results reveal that the mitigating effect of OLS was even greater than that of DiD, which was significant for only three food insecurity indicators (skip, starve, hungry). Overall, the results are consistent with the DiD estimates.

Table 6: Heterogeneous effects of social protection on food insecurity (area of residence, gender of household head, wealth status)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	**Skip**	**Exhaust**	**Starve**	**Not enough**	**Not quality**	**Little food**	**Ate less**	**Hungry**	**Food index**	**Food count**
Rural										
ATET	-0.090**	-0.048**	-0.136***	-0.013**	-0.036**	-0.065**	-0.030***	-0.046**	-0.129**	-0.410**
	(0.002)	(0.003)	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.003)	(0.010)
Observations	2 135	2 135	2 135	2 135	2 135	2 135	2 135	2 135	2 135	2 135
Urban										
ATET	-0.047***	-0.043	0.043**	-0.058**	-0.015**	0.041*	-0.002	0.039**	-0.028	-0.088
	(0.001)	(0.007)	(0.001)	(0.003)	(0.001)	(0.005)	(0.005)	(0.002)	(0.007)	(0.020)
Observations	1 422	1 422	1 422	1 422	1 422	1 422	1 422	1 422	1 422	1 422
Female headed										
ATET	-0.157***	-0.116**	-0.000	-0.143***	-0.131***	-0.082**	-0.063***	-0.125**	-0.281***	-0.868***
	(0.001)	(0.003)	(0.002)	(0.001)	(0.000)	(0.002)	(0.001)	(0.004)	(0.003)	(0.011)
Observations	716	716	716	716	716	716	716	716	716	716
Male headed										
ATET	-0.045***	-0.025***	-0.080***	-0.003**	0.003**	0.001	-0.004***	0.022***	-0.029***	-0.099***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Observations	2 841	2 841	2 841	2 841	2 841	2 841	2 841	2 841	2 841	2 841
Poor										
ATET	-0.072***	-0.044***	-0.062***	-0.029***	-0.027***	-0.021***	-0.018**	-0.012**	-0.084***	-0.267***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
Observations	3 557	3 557	3 557	3 557	3 557	3 557	3 557	3 557	3 557	3 557
Non-poor										
ATET	-0.071***	-0.046**	-0.031**	-0.010**	-0.000	0.010*	0.004*	-0.005**	-0.036**	-0.113**
	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.002)	(0.006)
Observations	2 118	2 118	2 118	2 118	2 118	2 118	2 118	2 118	2 118	2 118

Notes: Estimations were adjusted for covariates, panel effects, and time effects and controlled for predicted weighted attrition.
*** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$
Source: Authors' calculation using the LSMS-ISA dataset

Table 7: Effect of social protection (cash or food assistance) on food insecurity during COVID-19

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	**Skip**	**Exhaust**	**Starve**	**Not enough**	**Not quality**	**Little food**	**Ate less**	**Hungry**	**Food index**	**Food count**
COVID	0.439***	0.327***	0.226***	0.266***	0.286***	0.292***	0.348***	0.361***	0.808***	2.513***
	(0.020)	(0.020)	(0.014)	(0.023)	(0.023)	(0.023)	(0.022)	(0.020)	(0.043)	(0.133)
Social protection	0.115***	0.041	0.008	0.060*	0.024	0.061*	0.063*	0.057*	0.140**	0.430**
	(0.035)	(0.034)	(0.019)	(0.036)	(0.037)	(0.037)	(0.037)	(0.032)	(0.070)	(0.217)
COVID*SP	-0.097**	-0.040	-0.059**	-0.054	-0.038	-0.028	-0.041	-0.070*	-0.130	-0.407
	(0.039)	(0.039)	(0.026)	(0.042)	(0.042)	(0.042)	(0.042)	(0.039)	(0.081)	(0.251)
Female headed	0.095***	0.071***	0.014	0.114***	0.111***	0.120***	0.114***	0.098***	0.242***	0.743***
	(0.019)	(0.021)	(0.017)	(0.022)	(0.021)	(0.021)	(0.021)	(0.023)	(0.042)	(0.129)
Household head age	-0.001*	-0.002***	-0.002***	-0.000	-0.000	-0.000	-0.001	-0.001**	-0.002**	-0.007**
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)
Household	-0.001	0.002	0.014***	-0.006**	-0.002	-0.004	-0.003	0.003	0.001	0.005
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.005)	(0.015)
Rural	-0.045***	-0.064***	0.027**	-0.041**	0.004	-0.025	-0.036**	-0.033*	-0.066*	-0.198*
	(0.015)	(0.016)	(0.014)	(0.018)	(0.017)	(0.017)	(0.017)	(0.018)	(0.035)	(0.108)
Constant	0.300***	0.378***	0.044	0.420***	0.422***	0.429***	0.403***	0.242***	-0.405***	2.576***
	(0.032)	(0.034)	(0.027)	(0.038)	(0.038)	(0.037)	(0.037)	(0.036)	(0.071)	(0.221)
Observations	8 400	8 400	8 400	6 643	6 643	6 643	6 643	6 643	6 643	6 643
R-squared	0.131	0.078	0.067	0.065	0.073	0.082	0.107	0.103	0.134	0.134

Notes: Robustness check using ordinary least squares; *** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$
Source: Authors' calculation using the LSMS-ISA dataset

4. Conclusion and policy implications

To pursue policies aimed at mitigating the negative effects of the COVID-19 pandemic, governments and policy makers need real data on the situation of households and on the effectiveness of interventions already taken in response to COVID-19. This paper assessed the effect of COVID-19 on food insecurity and the mitigating effect of social protection in Nigerian households. We employed the difference-in-differences approach on pre-COVID-19 and post-COVID-19 data. Overall, the results show that COVID-19 increased food insecurity within all households (beneficiary and non-beneficiary of social protection). The pandemic had a greater effect on food insecurity in rural, farming, male-headed and poor households. The results also indicate that households that received cash assistance were more food insecure during the pandemic than were those that received food assistance. These results imply that the mitigating effect of social protection is more effective for cash assistance than for food assistance. Furthermore, the mitigating effect of social assistance is greater in rural areas, farming areas, female-headed households and poor households.

Our results highlight the vital role that social protection could play in mitigating the adverse consequences of the COVID-19 pandemic. Consequently, governments and their development partners should rethink and revise national social protection strategies to provide more support to households and increase their resilience to adverse shocks. In particular, policies aimed at promoting cash assistance can have important implications for improving the food security of households in Nigeria. The targets should be women, poor households and those in rural areas who are involved in farming. Furthermore, social protection should be considered complementary to existing development systems. Our findings support that social protection likely protects only part of the population, as the coverage is still limited and the amount transferred is very low. Even those populations that benefit from social protection may need complementary support over the long term.

Indeed, the attenuating role of social protection, namely cash assistance, seems to operate only in the short term. Households are still exposed to subsequent shocks, as they mainly rely on their savings, which are limited, to cope with the shock. We therefore suggest two additional policies that may help increase household resilience to shocks. First, there is a need to prioritise investment in local job creation to curb income loss, as households with casual and unreliable jobs are more likely to lose jobs and are thus prone to severe food insecurity in times of shock. Second, there is a need to build a household wealth base, such as land tenure security or livestock, to improve resilience to shocks.

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Data availability

Data are available on the World Bank Microdata Library portal for registered users.

- COVID-19 National Longitudinal Phone Survey 2020–2021, Phase 1, Nigeria, 2020–2021 https://microdata.worldbank.org/index.php/catalog/3712

- General Household Survey, Panel 2018–2019, Wave 4, Nigeria, 2018–2019 https://microdata.worldbank.org/index.php/catalog/3557

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Appendices

Appendix 1: Attrition rate across waves

Round	Pre-COVID	Post-COVID lockdown												
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
Missing	0	0	0	25	69	94	111	139	140	161	165	173	0	**1 077**
Present	1 950	1 950	1 950	1 925	1 881	1 856	1 839	1 811	1 810	1 789	1 785	1 777	1 950	**24 273**
No. of unique HH	1 950	1 950	1 950	1 950	1 950	1 950	1 950	1 950	1 950	1 950	1 950	1 950	1 950	**25 350**
Attrition rate	0	0	0	0.012	0.035	0.048	0.056	0.071	0.071	0.082	0.084	0.088	0	**0.042**

Note: HH = households

Appendix 2: Determinants of attrition

VARIABLES	OLS
Age of head	0.000
	(0.000)
Rural (1 = yes)	0.016***
	(0.003)
Female-headed households (1 = yes)	0.018***
	(0.004)
Household size	-0.001*
	(0.000)
Non-poor households	0.018***
	(0.003)
Sick household member (1 = yes)	-0.030***
	(0.005)
Farming (1 = yes)	0.021***
	(0.004)
Number of gatherings attended in a week:	
One	-0.061***
	(0.004)
Two	-0.066***
	(0.005)
Three	-0.044***
	(0.005)
Four	-0.069***
	(0.006)
Five or more	-0.067***
	(0.005)
Constant	0.054***
	(0.007)
Observations	23 227
R-squared	0.021

Notes: Standard errors are in parentheses. *** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$
Source: Authors' calculation using the LSMS-ISA dataset