COVID-19 PANDEMIC, HOUSEHOLD INCOME AND COPING STRATEGIES IN NIGERIA

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ABSTRACT

This study analyzed the effects of the COVID-19 pandemic on household income and the determinants of coping strategies in Nigeria, using the combination of the COVID-19 National Longitudinal Phone Survey data and the fourth wave of the General Household Survey, Panel 2018-2019. The fourth wave of General Household Survey, Panel 2018-2019 data is part of the World Bank's Living Standards Measurement Study–Integrated Surveys on Agriculture (LSMS-ISA) and the National Bureau of Statistics of Nigeria collected the data in collaboration with the World Bank and funded by the Federal Government of Nigeria and the Bill and Melinda Gates Foundation. The COVID-19 National Longitudinal Phone Survey 2020, Baseline was implemented by the National Bureau of Statistics in collaboration with the World Bank. The analyses were based on multinomial logistic and multivariate probit models. Multinomial logit regression analysis shows that households that consider the pandemic a substantial threat and households with older heads were more likely to have decreased income while households that received transfer income and self-employed were more likely to have increased income. Several household characteristics exhibited different levels of influence on the choice of coping strategies during the lockdown. Therefore, policy options and support facilities should be developed to foster meaningful (wage/self) employment and coping strategies to achieve optimal results in response to the pandemic.

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INTRODUCTION

In the first half of 2020, the world was hit by a pandemic. It was confirmed to be caused by a new coronavirus (SARS-CoV-2) and the disease was later referred to as COVID-19 (WHO, 2021a). After emerging from Wuhan City in China's Hubei province, COVID-19 soon spread around the world. This caused immense economic and human loss. By 12th August 2021, there had been over 205 million cases of COVID-19 worldwide, and over 4.3 million deaths globally (Hopkins, 2021; WHO, 2021b). Since the onset of the pandemic, several countries have intervened through a range of non-pharmacological public health strategies (including social distancing) to prevent or slow down the spread of COVID-19. The social distancing strategy requires both public institutions and the organized private sector to shut down, mass gatherings were disallowed, and lock-down measures were imposed in many countries, permitting

movement for only those rendering essential services. The main aim of the social distancing is to cut down the number of daily COVID-19 infections, and thus reduce the pressure on the respective countries' medical services.

A significant downturn in business activities occurred due to the COVID-19 pandemic. The International Monetary Fund predicted that the world economy will decline by about 4.9% this year (IMF, 2020). The 2020 recession is projected to be more severe than the last recession caused by Global Financial Crisis in 2008-2009. The study premised its conclusions on high intensity in social distancing activities; weaker economic activities during lockdown and sharp declines in productivity across entities opened for business. The economic impacts have been pervasive and unpredictable with various impacts on labour markets, supply chain of production, financial system, food systems, and the global economy. The pandemic and the attendant public health intervention are projected to contribute to increased economic inequality and have a specific detrimental impact on some socio-demographic groups, especially the poor in developing countries.

The vast majority of the global poor lives in developing regions such as sub-Saharan Africa and relies largely on the primary sector (mainly agriculture) for their livelihood. Agricultural production requires physical and outdoor activities on the farm. During the pandemic, however, movement restrictions increase the vulnerability of households that rely on this sector (and other sectors that require outdoor activity) for their livelihoods. Since the world is still in the early stages of the virus, there is a dearth of knowledge on how public health interventions targeted at combatting COVID-19, such as social distancing and the attendant lockdowns, affect livelihoods within developing countries. Furthermore, the Delta variant of Covid-19, considered the most transmissible variant of the virus (United Nations, 2021), has increased concerns for new lockdown decisions by public authorities globally. By 12th August 2021, Nigeria had recorded 180, 661 Covid-19 cases and 2,200 deaths (NCDC, 2021). At the same time, Nigeria reported its first case of the Delta variant. The country's public health authorities have reported early confirmed cases of the Delta variant in the country, and this has sparked concerns about new lockdown measures. Livelihood security could further worsen with the new variant and planned national lockdowns.

Whilst policymakers aim to mitigate the socio-economic impacts of interrupted livelihood supply chains, early research findings on the effects of public health interventions can provide the basis for recovery policies and enhance preparation for impending pandemics. We investigated the shocks to household incomes and coping strategies in response to the COVID-19 pandemic in Nigeria. Agriculture is a key element of the country's economy; it is the largest sector and employer of labour. However, about 83 million Nigerians now live below the national poverty line (World Bank, 2020). According to the new estimates, due to anti-COVID-19 measures, about 5 million Nigerians are projected to be forced into a poverty trap (IMF, 2020; World Bank, 2020).

In late March 2020, the Federal Government of Nigeria (FGN) implemented movement control measures for people and goods. While the FGN measures largely coordinated the measures, State Governments also implemented diverse state- and local-level lock-down restrictions. The diverse Federal and State-level anti-COVID-19 lock-down measures, including the intensity of implementation and compliance, and the vast regional differences in differences in labor force participation and market access, could result in disproportionate effects of these anti-COVID-19 measures on household livelihood and welfare. While substantial anecdotal evidence exists on the effect of COVID-19 on socio-economic outcomes in developing countries and different researchers have analyzed the likely effects of the pandemic on global and national economic metrics, including poverty, public spending, GDP growth, fiscal deficits, unemployment, etc. (ILO, 2020; Ozili, 2020; Ozili and Arun, 2020; World Bank, 2020), there remains a dearth of evidence on the effects of the pandemic and subsequent lockdown policies on individual and household livelihoods using nationally-representative household survey data. The economic impacts of this pandemic are expected to affect individuals and households disproportionately, based on their socioeconomic status, livelihood strategies, market access, etc. Therefore, it is essential to analyze the impacts on households and coping strategies that can be improved to secure household income and livelihoods. The impacts of COVID-19 and related restrictions on households have been studied in Kenya and Uganda (Kansiime et al., 2021) and India (Harris et al., 2020) and Nigeria (Amare et al., 2021), and reported significant heterogeneity of the impacts of anti-COVID-19 responses

on household agricultural activities and income. By examining its implications for household income using nationally representative household survey data from Nigeria, we are adding to the increasing body of literature on the COVID-19 pandemic. This study answered the following pressing questions:

1. Through what pathways has COVID-19 impacted household incomes?
2. What factors influenced household income outcomes during the COVID-19 pandemic?
3. What coping strategies have been introduced and what are the determinants of these coping strategies?

To fill the knowledge gap, this study used the COVID-19 National Longitudinal Phone Survey to analyze the factors influencing whether the source of income of a household had increased, decreased, or remained unchanged during the COVID-19 pandemic in a multinomial logistic (MNL) regression framework. We also analyze household coping strategies and their determinants using a multivariate probit model.

The remainder of this study is organized as follows: A short overview of the COVID-19 pandemic in Nigeria and policy measures to mitigate the impact of the pandemic are discussed in Section two. Section three describes the data source and estimation techniques. Sections four and five present the empirical results and discussions, respectively. Section six concludes the study.

Context and Response to COVID-19 in Nigeria

Nigeria is located in West Africa; it also has the largest population on the African continent. Furthermore, it has a high poverty rate, a large informal sector, high dependence on imported staples, and high exposure to shocks (Amare *et al.*, 2021). The first COVID-19 case in Nigeria was recorded on February 27th [NCDC, 2021] (NCDC, 2021). The high likelihood of a massive, rapid, and lethal epidemic spurred a quick response in Nigeria, given its population density and the limited healthcare system. From 30 March 2020, the federal government suspended economic and industrial operations and enforced a restriction on the mobility of persons and products considered 'non-essential' (NCDC, 2020). The federal government closed all schools in mid-March, and several states and local authorities introduced bans on public and social gatherings. At the end of March, the federal government closed its land and air borders to all

travelers and suspended passenger rail services within the country (Amare *et al.*, 2021; NCDC, 2020). Furthermore, the federal government announced fiscal and stimulus measures, amounting to 500 billion Naira to support households, and small and medium-scale enterprises affected by COVID-19 (FMFBNP, 2020).

On March 29, 2020, the federal government announced lockdown measures and strict mobility restrictions for Abuja FCT, Lagos, and Ogun states, which lasted for five weeks from March 30 until May 4. The federal government also introduced similar lockdown measures for Kano state, which started in mid-April and lasted for seven weeks. Lockdown restrictions in other states were introduced by state governments independently of the federal government, including in Akwa Ibom, Borno, Osun, and Rivers. In most cases, the lockdowns remained in force for about 5-8 weeks. These measures restricted the movement of residents and led to the closure of business operations, and the closure of regional borders linking lockdown areas with the rest of the country. These lockdown and mobility restrictions are likely to disrupt major economic activities, including local businesses (Amare *et al.*, 2021). Nigeria is highly susceptible to income shocks and food insecurity associated with the spread of the pandemic. The public restrictions (also known as 'lockdown') have presented challenges for millions of poor households. These challenges include disruption of agricultural supply chains due to compulsory inter-regional border controls, shortage of personal protective equipment to conform with social distance rules, and local requirements, misgivings, and misconceptions regarding COVID-19. These undesired challenges potentially lead to the disruption of individual and household welfare, including income and food security.

METHODOLOGY
Dataset
In this study, we combined data from the fourth wave of the General Household Survey, Panel 2018-2019 and the COVID-19 National Longitudinal Phone Survey 2020, Baseline- to investigate the effect of the COVID-19 pandemic on households' income.

The fourth wave of General Household Survey, Panel 2018-2019 data is part of the World Bank's Living Standards Measurement Study–Integrated Surveys on Agriculture (LSMS-ISA) and the National Bureau of Statistics of Nigeria collected the data in collaboration

with the World Bank and funded by the Federal Government of Nigeria and the Bill and Melinda Gates Foundation[1]. The COVID-19 National Longitudinal Phone Survey 2020, Baseline was implemented by the National Bureau of Statistics in collaboration with the World Bank. The National Bureau of Statistics (primary investigators) implemented the phone survey in collaboration with the World Bank and the survey was sponsored by the Bill and Melinda Gates Foundation, the Federal Government of Nigeria and the United States Agency for International Development.[2] These data are nationally representative, and they provide detailed information on employment, income, food, and nutrition security indicators.

Following the COVID-19 pandemic, the LSMS-ISA program-initiated tracking of national samples of households that had been interviewed during the latest rounds of the LSMS-ISA surveys using phone surveys. Among the total sample of households (4,976) interviewed in the latest round (post-harvest January/February visit) of the GHS-P survey in 2019, 4,934 (99.2%) provided at least one phone number. Out of the full sample of households with phone numbers, a random sample of 3,000 households was selected for the phone survey, to collect a complete sample of 1800 households that enable statistical monitoring of (monthly) changes in key outcomes of interest. Out of these 3,000 households prepared for the phone survey, 69 percent of sampled households were successfully contacted, and among these, 94 percent (1,950) households were fully interviewed (National Bureau of Statistics, 2020a). The final complete sample for the phone survey constitutes these 1,950 households, and they are expected to be contacted in subsequent rounds of the survey.

In this paper, we used the first round of the phone survey, which was administered in April-May 2020, and the fourth wave of the General Household Survey, Panel 2018-2019 (National Bureau of Statistics, 2020b, 2019). The phone surveys are planned to be monthly surveys and hence are high-frequency surveys and were carried out by trained NBS interviewers with relevant experiences in conducting phone surveys (National Bureau of Statistics (NBS), 2021).

There were rounds of monitoring and evaluation as quality checks to ensure good quality data (National Bureau of Statistics (NBS), 2021). These high-frequency phone surveys covered topics including (1) knowledge regarding the spread of COVID-19; (2) employment and income losses; (3) access to food and non-food necessities. We are particularly interested in tracking disruptions in economic activities. The pre-COVID-19 face-to-face survey provided the households' wealth data which was not currently provided by the post-COVID-19 phone survey. The phone survey included incorporating both lock-down policies, outcomes and other household-specific characteristics.

Empirical Strategy
Research Question One
To provide an answer to our first research question related to the pathways through which Covid19 has impacted household incomes in Nigeria, we use a frequency chart to summarize the self-reported pathways in the sample.

Research Question Two
To provide an answer to our second research question related to what factors influenced household income outcomes during the COVID-19 pandemic, we use a multinomial logit framework to understand the role of Covid-19 perception and household characteristics variables on the different household income outcomes in Nigeria. The analyses involve a multinomial logit (MNL) model specification to consider the relationship because we assume no precise natural order for the elements of the outcome variable. The MNL model can be viewed as the simultaneous estimation of binary logits for all pairs of outcome categories. In this case, efficient estimation of the model requires that all pairs be estimated simultaneously. See further explanation below (Cheng and Long, 2007; Long and Freese, 2006).

Let y be the dependent variable with J outcomes numbered from 1 to J. Let x be a vector of K independent variables plus a constant for the intercept. The probability of observing outcome m for a given x is

$$Pr(y = m|x) = \frac{\exp(x\beta_m)}{\sum_{j=1}^{J} \exp(x\beta_j)} \; for \; m = 1, \dots, J, . (1)$$

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[1]

https://microdata.worldbank.org/index.php/catalog/3557#metadata-data_access

[2]

https://microdata.worldbank.org/index.php/catalog/3712.

The vector $\beta_m = (\beta_{0m} \cdots \beta_{km} \cdots \beta_{Km})'$ includes the intercept β_{0m} and coefficients β_{km} for the effect of x_k on outcome m. To identify the model, we assume without loss of generality that $\beta = 0$. The model can also be written in terms of the odds for each pair of options m and n:

$$\Omega_{m|n} = exp(x[\beta_m - \beta_n]), \quad \dots\dots \qquad (2)$$

From Eq. (2), the odds of choosing m versus n do not depend on which other outcomes are possible. That is, the odds are determined only by the coefficient vectors for m and n—namely, β_m and β_n. This is the independence of irrelevant alternatives (IIA) property.

Next, we discuss the testing for the IIA property. The simultaneous estimation of the binary logits in MNL model provides efficient estimates. However, it imposes certain logical constraints among parameters. Furthermore, it has been demonstrated that consistent but inefficient estimates can be obtained by estimating a sequence of binary logits (Begg & Gray, 1984). For instance, an MNL model with three outcomes may be estimated by estimating two binary logits, one comparing outcome 1 to 2 and another comparing outcome 1 to 3. IIA's choice set partitioning tests to entail comparing estimates based on all outcomes concurrently against those based on a reduced choice set. A formal description of the test is presented next. The full model is given in Eq. (1), with estimates $\hat{\beta}_m^l$. The superscript l indicates that the estimates are from the full model that includes all outcomes. The restricted estimation is identical to the full model except that the equation for outcome J is excluded:

$$\Pr(y = m|x) = \frac{exp(x\beta_m)}{\sum_{j=1}^{J-1} exp(x\beta_j)} \ for \ m = 1, \dots, J-1, \dots \ (3)$$

where we assume that β_1 equals zero. While we eliminated outcome J, any other outcome may have been eliminated as well. Estimates $\hat{\beta}_m^s$ from the restricted choice set are consistent but inefficient under IIA, whereas estimates $\hat{\beta}_m^l$ from the full model are consistent and efficient. The various IIA tests include comparing complete model estimates to those from constrained estimations. The comment tests for IIA in the empirical literature include the Small and Hsiao Test and Hausman and MCFadden Test. These IIA tests compare the estimates $\hat{\beta}_m^l$, which are consistent and efficient if the null hypothesis is true, to the consistent but inefficient estimates $\hat{\beta}_m^s$. For a detailed discussion, see (Cheng & Long, 2007; Long & Freese, 2014).

Research Question Three

To address our third research question, which is to determine the factors influencing the coping strategies adopted by households in response to the COVID-19 pandemic, we assume that different coping strategies are interdependent, implying that the effect of various factors influencing households' decisions to adopt multiple coping strategies could be diverse. As a result, we presume the potential of substitutability or complementarity between recognized coping strategies, contrary to the widely held belief that coping strategies are mutually exclusive and self-contained.

Following Oyewale *et al.* (2020) we used a Multivariate Probit Model (MVP) approach to determine the determinants influencing Nigerian households' coping strategies in the face of the COVID-19 epidemic. Unlike other dichotomous models, the MVP model allows for correlation between error components in latent equations, which can account for unobservable factors affecting an entrepreneur's adoption decisions (Belderbos *et al.*, 2004). These correlations allow for an error term for both positive and negative correlations (complementarity and substitutability) between numerous coping strategies (Bedeke *et al.*, 2019).

We modelled this using a random utility framework for a j_{th} entrepreneur $(j = 1, \dots, K)$ faced with the decision of whether to adopt or not to adopt a set of interdependent coping strategies $q(q = 1, \dots, Q)$. The utility U_a denotes the benefits accruing to a household from not adopting any strategy, whereas U_b denotes the benefits accruing to a household from adopting coping strategies, which in the context of this study include the sale of assets (SOA), reliance on savings (SAV), income diversification (DIV), reduced consumption (CONS), credit purchases (CRED), received assistance and loans (ASST). Additionally, we hypothesize that a j_{th} the household will adopt coping strategy b in household q only if the net benefit Y_{jqb}^*, a latent variable, is larger than zero. This is demonstrated as follows:

$$Y^* = U_b^* - U_a > 0 \quad \dots\dots\dots\dots\dots (4)$$

As such, the net benefit $Y*jqb$ is determined by the entrepreneur's observed socioeconomic, the severity of COVID-19 impact, and government measures (Xjq) and the error term (εjq):

$$Y_{jqb}^* = X_{jq}\beta_b + \mu_{jq} \quad \dots\dots\dots\dots (5)$$

where b sale of assets (SOA), reliance on savings (SAV), income diversification (DIV), reduced consumption

(CONS), credit purchases (CRED), received assistance and loans (ASST). The observed dichotomous outcome equation for each choice of coping strategies adopted by the entrepreneur is given as:

$$Y_{jqb} = \begin{cases} 1 \; if \; Y^*_{jqb} > 0 \\ 0 \; otherwise \end{cases} \; where \; b$$
$$= SOA, SAV, DIV, CONS, CRED, ASST \;(6)$$

If the adoption of b types of coping strategies is assumed to be interdependent or occur at the same time, the error term is assumed to jointly follow a multivariate normal distribution pattern with zero conditional mean and a unitary variance. The symmetric covariance matrix π is illustrated as follows:

$$\pi = \begin{cases} 1 & \delta SOASAV & \delta SOADIV & \delta SOACONS & \delta SOACRED & \delta SOAASST \\ \delta SAVSOA & 1 & \delta SAVDIV & \delta SAVCONS & \delta SAVCRED & \delta SAVASST \\ \delta DIVSOA & \delta DIVSAV & 1 & \delta DIVCONS & \delta DIVCRED & \delta DIVASST \\ \delta CONSOS & \delta CONSSAV & \delta CONSDIV & 1 & \delta CONSCRED & \delta CONSASST \\ \delta CREDSOA & \delta CREDSAV & \delta CREDDIV & CREDCONS & 1 & \delta CREDASST \\ \delta ASSTSOA & \delta ASSTSAV & \delta ASSTDIV & \delta ASSTCONS & \delta ASSTCRED & 1 \end{cases}$$

The off-diagonals elements in the covariance matrix represent the unobserved correlation between the error components of the different types of coping strategies.

For the explanatory variables, we included a perception variable to assess the household's risk perception of the pandemic to household income. Additionally, we included household socio-economic, demographic and institutional variables (e.g., sex, age, education, wealth, location, etc.) as explanatory variables. We present summary statistics and empirical results in Section four. All analyses were conducted using STATA 16.

RESULTS
Summary Statistics
Table 1 presents the summary statistics for variables

used in our analysis. The total sample of study participants was 1445. Households with missing data on the primary outcome (n = 505) were excluded. When surveyed, more than three quarters (78.6%) of the respondents reported a decrease in total household income, compared to before the COVID-19 outbreak. Conversely, 4.9% of the respondents reported an increase in total household income, while about 16.5% of the respondents reported no change in total household income (see Figure 1).

Thus, the economic impact of COVID-19 is substantial in Nigeria. This finding is in line with the overall perceptions regarding the negative effects of the COVID-19 pandemic on labour markets and income (ILO-OECD, 2020).
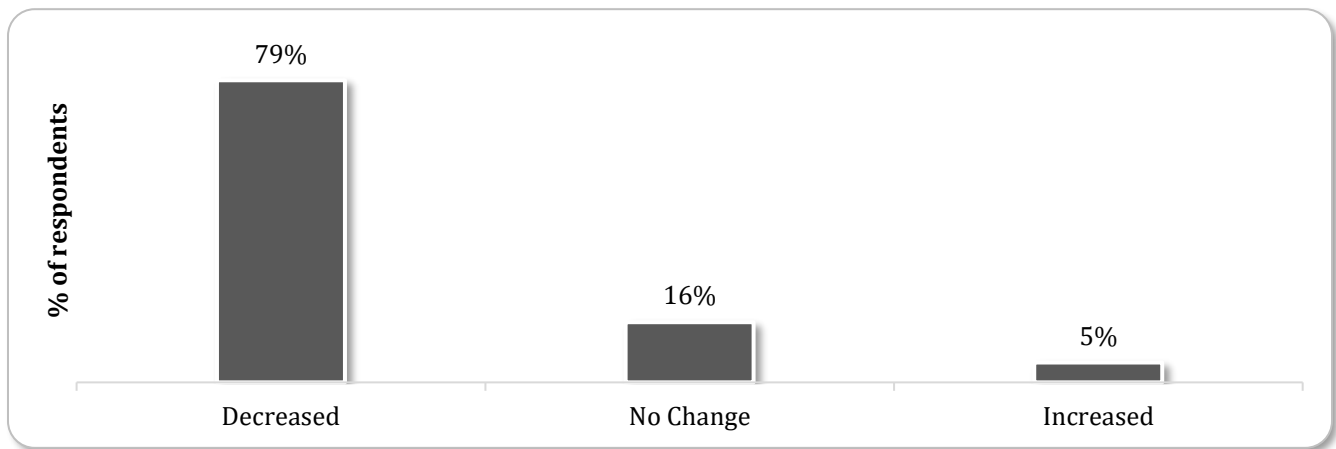

Figure 1. Nigerian households' responses to total household income due to COVID-19, between April and May 2020 compared to the baseline period: February 2020.

Additionally, the average household head in the sample was 50 years old. Approximately 35% of the household heads had attained at least a secondary level of education. The majority of the household heads were male (about 82%) overseeing households comprising about five on average. Less than half (about 35%) of the household heads have access to financial institutions such as an account in a commercial bank.

Considering sources of livelihood, more than half of the respondents were farmers or farm households (about 77%). Additionally, about 41% of the respondents in the sample reportedly depend on transfer payments, about 64% of the households also reported that they were self-

employed, while about 34% reported that they were wage or salary earners in paid employment. It is, however, important to note at this point that households were allowed to report multiple sources of income or livelihood in the phone survey. Thus, there were multiple sources of livelihood per household, and interpretations of the results require utmost care. The majority of the household (about 61%) also live in rural areas. Considering Nigeria's major geo-political zones, our sample was fairly equally distributed among the six zones as follows: Northcentral (16.4%), Northeast (16.8%), Northwest (15.4%), Southeast (18.1%), Southsouth (14.3%), Southwest (19.1%).

Table 1. Summary statistics for variables used in the analysis.

Variable	Description	Mean/%
Household Total Income		
No Change	No Change	16.5%
Increased	Increased	4.9%
Decreased	Decreased	78.6%
Covid-19 business restrictions	Business restrictions imposed in the area (1 = yes)	30.1%
Age	Age of head of household	50.2
Gender	Gender of household head (1 = male)	81.7%
Size	Household size	5.4
Education	Secondary education (1 = yes)	34.6%
Wealth quintiles		
Quintile 1	Quintile 1	14.3%
Quintile 2	Quintile 2	15.6%
Quintile 3	Quintile 3	20.6%
Quintile 4	Quintile 4	23.3%
Quintile 5	Quintile 5	26.3%
Finance	Access to savings in a bank (1 = yes)	34.7%
Livelihood means		
Farming	Farming household (1 = yes)	76.6%
Transfers	Received transfer income and other support (1 = yes)	41.2%
Self-employed	Self-employed (1 = yes)	63.5%
Wage earner	Wage earner (1 = yes)	33.7%
Located in an urban area	Located in an urban area (1 = yes)	38.7%
Located in a rural area	Located in a rural area (1 = yes)	61.3%
Region		
North central	North central (1 = yes)	16.4%
North east	North east (1 = yes)	16.8%
North west	North west (1 = yes)	15.4%
South east	South east (1 = yes)	18.1%
South south	South south (1 = yes)	14.3%
South west	South west (1 = yes)	19.1%
Total observation		1445

Note: 505 observations have missing values for key variables used in the analysis; hence they were discarded in the current study. Standard deviation for age and family size are 14.51 years and 3.33, respectively.

Effect of COVID-19 on income-generating activities
Additionally, the selected households were asked to report the pandemic-linked pathways that triggered the shocks to household incomes during the period. The most reported pathways of the pandemic are illustrated in Figure 2. The highest reported pathway among the households was 'closure of business or office due to COVID-19 restrictions.' This reason was reported in 65.8 % of the cases. Additional pathways include: 'no customers / less customers (19.5%)', 'can't travel /

transport goods for sale (2.6%)', 'can't get inputs (1.8%)' and 'need to take care of a family member (1.2%)'. Additionally, about 9% of the respondents were classified under the category 'other reasons.' These other reasons category includes reasons such as retired, laid off while business continues, vacation and furlough. These pathways reported by Nigerian households are consistent with recent reports of the disruptions linked to the COVID-19 pandemic in other countries (ILO, 2020; Kansiime *et al.*, 2021; World Bank, 2020).
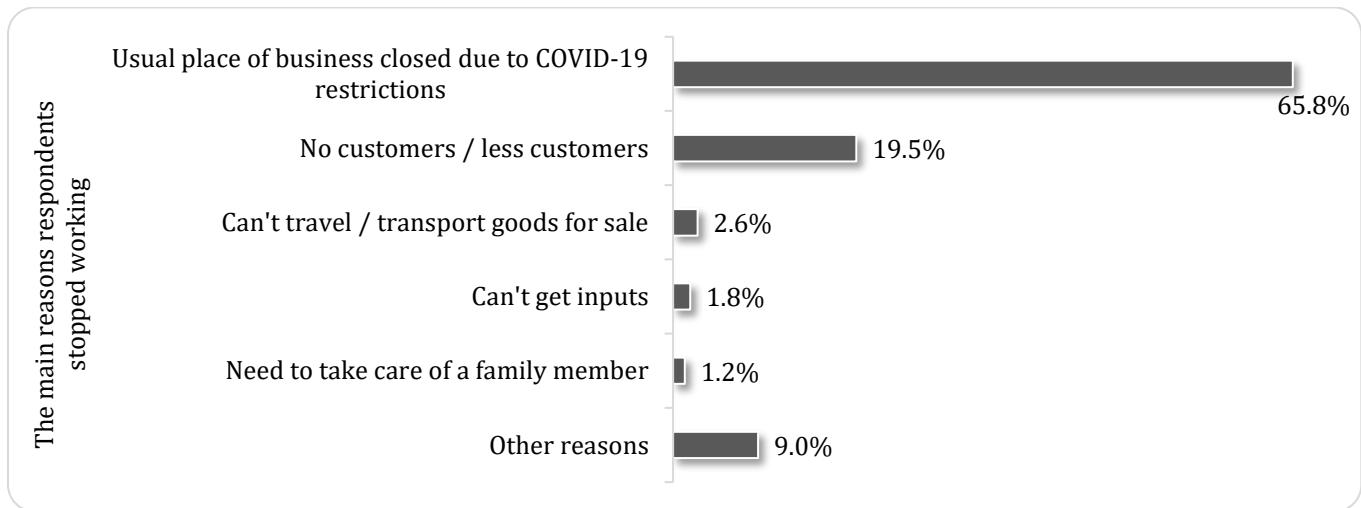

Figure 2. Nigerian households' responses to the main reason they stopped working between April and May 2020 compared to the baseline period: February 2020.

Empirical results: multinomial logit results of the effect of COVID-19 on income
Up to this point, it is still unclear how the different groups are affected by the pandemic and the public restriction of business non-essential activities. We turn to multinomial logit regression models to address this question. Table 2 presents multinomial logistic (MNL) estimation results on the factors that determine whether a respondent's regular source of income has been affected by the COVID-19 pandemic. The statistics reported include the logistic regression coefficients, the odds ratio (O.R.) which is also known as the relative risk ratio (RRR), the standard errors and the 95% confidence intervals.

Results for increased income versus no change in income categories
For this category, the results revealed the following: if a household were to switch its perception of the pandemic as a substantial threat from no threat, the multinomial

log-odds for increased income relative to no change in income would be expected to decrease by 1.276 units while holding all other variables in the model constant. Similarly, for a one-year increase in the age of the household head, the multinomial log-odds for increased income relative to no change in income would be expected to decrease by 0.024 units. Concerning wealth (income quintiles), if a household's wealth were to increase from the first quintile to the second and fifth quintiles, the multinomial log-odds for increased income relative to no change in income would be expected to decrease by 0.962 and 1.302 units, respectively. Here, the first quintile is the poorest and is also the base category. Considering receipt of transfer income and self-employment by the household, the results suggest that if a household were to receive transfer income and have self-employment, the multinomial log-odds for increased income relative to no change in income would be expected to increase by 0.650 and 0.927 units, respectively. Additionally, if a household were to move

from the Northcentral (base category) to the southeast zone, the multinomial log-odds for increased income relative to no change in income would be expected to increase by 1.118 units.

Table 2. Multinomial logit regression result of factors determining whether perception and socioeconomic/demographic factors during the COVID-19 pandemic affected household income. Results increased income vs. no change in income and decreased income vs. no change in income-associated categories.

	Increased income vs. no change in income					Decreased income vs. no change in income				
	β	S. E.	P	95% C.I.		β	S. E.	P	95% C.I.	
Perception (Ref. = not a threat)										
Not much of a threat	0.197	0.901	0.790	0.285	5.196	0.782	1.180	0.147	0.759	6.295
Moderate threat	-0.160	0.474	0.773	0.286	2.534	0.272	0.521	0.493	0.603	2.855
Substantial threat	-1.276**	0.146	0.014	0.100	0.776	0.765**	0.782	0.036	1.052	4.386
Age	-0.024**	0.011	0.030	0.956	0.998	-0.014**	0.006	0.026	0.975	0.998
Male-headed household	0.131	0.566	0.792	0.431	3.016	-0.341	0.180	0.177	0.433	1.167
Family size	0.005	0.049	0.913	0.913	1.107	-0.021	0.027	0.453	0.928	1.034
Education	0.132	0.384	0.695	0.590	2.206	0.609***	0.337	0.001	1.284	2.634
Wealth Quintile Quintile 1 (Ref.)										
Quintile 2	-0.962*	0.220	0.094	0.124	1.178	-0.477	0.238	0.214	0.293	1.316
Quintile 3	-0.435	0.346	0.415	0.227	1.843	-0.205	0.305	0.583	0.392	1.695
Quintile 4	-0.733	0.263	0.181	0.164	1.407	-0.286	0.276	0.436	0.365	1.545
Quintile 5	-1.302**	0.159	0.026	0.086	0.858	-0.594	0.203	0.107	0.268	1.136
Access to financial institution	-0.468	0.210	0.163	0.324	1.209	-0.264	0.132	0.125	0.549	1.076
Farm enterprise	0.432	0.603	0.270	0.715	3.317	0.570***	0.337	0.003	1.217	2.568
Transfer income	0.650**	0.564	0.027	1.076	3.410	0.023	0.167	0.890	0.742	1.410
Self-employment	0.927***	0.795	0.003	1.363	4.679	0.848***	0.380	0.000	1.697	3.212
Wage employment	-0.172	0.259	0.575	0.461	1.537	-0.070	0.157	0.677	0.671	1.296
Location (Ref. = Rural)										
Urban	-0.754**	0.172	0.039	0.230	0.964	0.174	0.226	0.361	0.820	1.727
Geographical Zone (Ref. = North central)										
Northeast	-0.017	0.565	0.976	0.319	3.030	0.411	0.447	0.165	0.844	2.698
Northwest	0.972*	1.445	0.076	0.905	7.718	0.701**	0.656	0.031	1.066	3.814
Southeast	1.118**	1.567	0.029	1.121	8.350	1.169***	0.912	0.000	1.847	5.610
Southsouth	0.856*	1.158	0.082	0.898	6.173	0.325	0.357	0.207	0.836	2.293
Southwest	-0.262	0.425	0.636	0.261	2.273	-0.171	0.208	0.488	0.519	1.368
Constant	0.455	1.685	0.670	0.194	12.81	1.085*	1.934	0.097	0.822	10.65

Note: Ref. is the reference/omitted category. Base category = No change in Income; β represents the regression coefficient; S.E. is the standard error; P is the statistical p-value. C.I. is the confidence interval. ***, **, * indicate statistical significance at 1%, 5% and 10%, respectively.

Table 3. Predicted probabilities and summary statistics of the dependent variable (Total Income).

Variable	Mean	Std. Dev.	Min	Max	Frequency	Percentage
No Change	0.158	0.116	0.011	0.680	228	15.77
Increased	0.052	0.057	0.004	0.460	75	5.19
Decreased	0.790	0.123	0.273	0.969	1,143	79.05
Observations	1421				1,446	100

In this study, Hausman tests (Table 4) suggest that the IIA property has not been violated. Thus, our estimated model based on MNL is appropriate and efficient (Long & Freese, 2014).

Table 4. Tests of Independence of Irrelevant Alternatives (IIA) Property.

	Hausman tests of IIA assumption (N=1421)			Suest-based Hausman tests of IIA assumption (N=1421)		
Category	chi2	df	P>chi2	chi2	df	P>chi2
No Change	-0.718	23	.	15.064	23	0.892
Increase	1.081	23	1.000	15.245	23	0.886
Decrease	0.068	23	1.000	12.002	23	0.970

Note: H_0: Odds (Outcome-J vs Outcome-K) are independent of other alternatives. A significant test is evidence against H_0.

Results for decreased income versus no change in income categories

For this category, the results revealed the following: if a household were to switch its perception of the pandemic as a substantial threat from no threat, the multinomial log-odds for decreased income relative to no change in income would be expected to increase by 0.765 unit while holding all other variables in the model constant. Similarly, for a one-year increase in the age of the household head, the multinomial log-odds for decreased income relative to no change in income would be expected to decrease by 0.014 units. Besides, for a one-year increase in the educational attainment of the household head, the multinomial log-odds for decreased income relative to no change in income would be expected to increase by 0.609 units. Considering engagement in farm enterprise and self-employment by the household, the results suggest that if a household were to engage in farm enterprise and have self-employment, the multinomial log-odds for decreased income relative to no change in income would be expected to increase by 0.570 and 0.848 units, respectively.

Additionally, if a household were to move from the northcentral (base category) to the northwest or southeast zones, the multinomial log-odds for decreased income relative to no change in income would be expected to increase by 0.701 and 1.169 units, respectively.

Coping strategies

Figure 3 shows the strategies employed by the households to cope with the disruptive income effects of the COVID-19 pandemic. The most used coping strategy is the purposeful reduction of household food consumption, while others are reliance on savings, reduction of non-food consumption, assistance from friends and family, engaging in additional income-generating activities and borrowing from friends and family. Since most households responded to the pandemic by reducing household food consumption, it points to the negative effects of the pandemic, not only on income but, on household food and nutrition security. Reliance on household saving was a significant means of smoothing household spending while the pandemic triggered delays in wages and pension payments as well as job losses. While relying on savings could serve as a temporary buffer for low-income households, lingering pandemics and associated lockdowns could result in depleting household savings, which could result in them falling deeper into the poverty trap. These household coping strategies are similar to those practiced in other developing countries (Amare *et al.*, 2021; Harris *et al.*, 2020; Kansiime *et al.*, 2021).
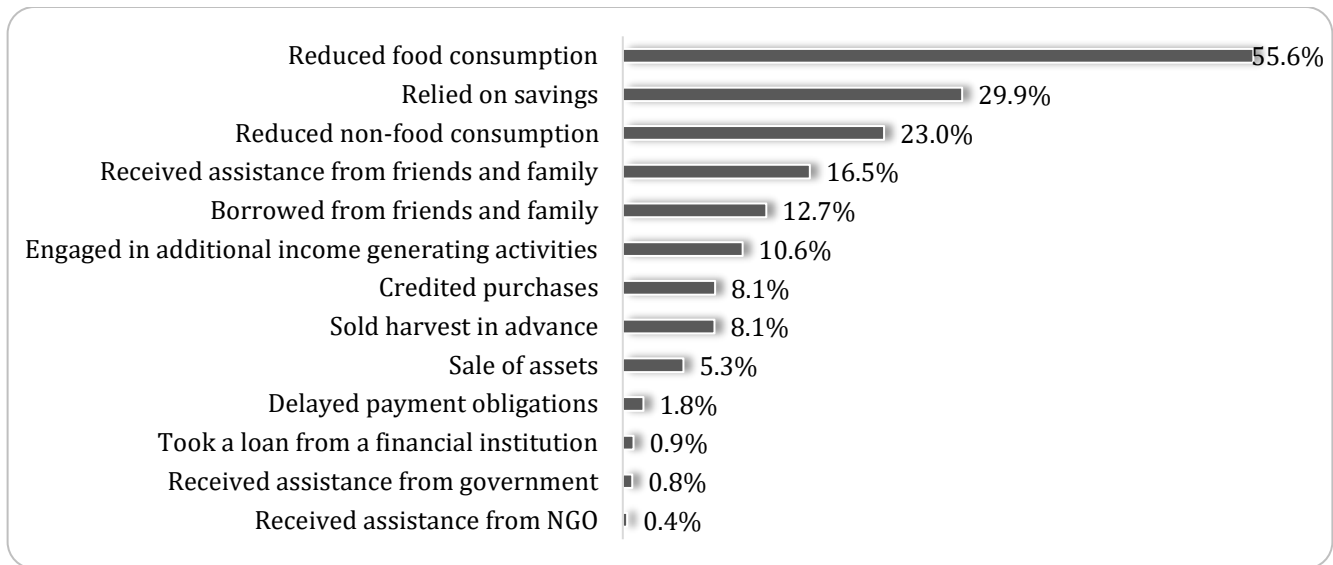
Figure 3. Coping strategies to COVID-19-induced income shocks, between April and May 2020 compared to the baseline period: February 2020.
Note: Multiple responses were recorded within households

Table 5 presents the results of the multivariate probit (MVP) analysis of the factors influencing the coping strategies used by households in Nigeria to mitigate the income effects of COVID-19. For brevity, this study relied on educated judgement to reduce the dimension of the reported coping strategies by grouping them into similar groups of coping strategies. We initially applied the principal components analysis (PCA) to reduce the dimensions, however, the results appeared implausible. We then relied on expert judgement to reduce the data dimensions. The authors reduced the 13 specific strategies to 6 major strategies. The authors merged strategies related to consumption (reduced food consumption, and reduced non-food consumption) and named it "reduce consumption", strategies related to any form of external assistance received (received assistance from friends and family, received assistance from government, and received assistance from NGO) were merged and named "received assistance", strategies related to credit purchases and taking loans (borrowed from friends and family, took a loan from a financial institution, credit purchases, and delayed payment obligations) were merged and renamed "credit", while other strategies remained unchanged. Table 5 presents the dimension reduction and grouping of coping strategies adopted in this study by Nigerian households. From Table 6, we find that the null hypothesis for the test of independence was rejected for all models, as the

likelihood ratio test (Prob > $\chi 2$ = 0.0000,) of independence of error terms was significant. Thus, the use of MVP is justified, indicating that the model captured wider effects than the single equation-probit model would (Arun and Yeo, 2019). Thus, the equations are interdependent and households simultaneously adopted multiple coping strategies to manage the COVID-19 pandemic restriction/lockdown in the country.

Out of the fifteen pairs of coping strategies, ten pairs had positive correlation coefficients implying that such pairs of coping strategies were complementary. The remaining five pairs yielded negative correlation coefficients indicating that the coping strategies were substitutes. Credit and reduced consumption (food and non-food consumption), income diversification and received assistance, credit and received assistance, income diversification and credit as well as credit and sale of assets were all significant. These pairs were complementary coping strategies used by households to survive during the COVID-19 lockdown. Relied on savings and receiving assistance and credit versus relying on savings were significant substitutes. This is expected because households with savings would have less likelihood to rely on credit (especially borrowing) and receive assistance from whatever to cope with risks. The amount of savings made by respondents would be a kind of cushion to any shock.

Table 5. Broad Categorization of Covid-19 Coping Strategies in Nigeria.

Coping Strategies	Broad Categories					
	Reduce consumption	Received assistance	Relied on savings	Credit	Income diversification	Sale of assets
Sale of Assets						✓
Engaged in additional income-generating activities					✓	
Received assistance from friends and family		✓				
Borrowed from friends and family				✓		
Took a loan from a financial institution				✓		
Credit purchases				✓		
Delayed payment obligations				✓		
Sold harvest in advance						✓
Reduced food consumption	✓					
Reduced non-food consumption	✓					
Relied on savings			✓			
Received assistance from government		✓				
Received assistance from NGO		✓				

Source: Authors' summary of self-reported coping strategies using World Bank (LSMS) 2020 Nigeria COVID-19 National Longitudinal Phone Survey data.

Table 6. Multivariate probit model statistics of factors influencing coping strategies to Covid-19 impacts in Nigeria.

Log-likelihood	-3709.22		
Wald chi2 (132)	606.67		
Prob>chi2	0.000		
Obs.	1421		
rho21	0.039 (0.051)	/atrho21	0.039 (0.051)
rho31	-0.06 (0.044)	/atrho31	-0.06 (0.045)
rho41	0.209 (0.048) ***	/atrho41	0.212 (0.051)***
rho51	0.011 (0.055)	/atrho51	0.011 (0.055)
rho61	0.059 (0.058)	/atrho61	0.059 (0.059)
rho32	-0.178 (0.05) ***	/atrho32	-0.18 (0.052) ***
rho42	0.186 (0.054) ***	/atrho42	0.188 (0.056) ***
rho52	0.142 (0.06) **	/atrho52	0.143 (0.061) **
rho62	0.058 (0.067)	/atrho62	0.058 (0.067)
rho43	-0.093 (0.051) *	/atrho43	-0.093 (0.051) *

rho53	-0.041 (0.059)	/atrho53	-0.041 (0.059)
rho63	0.027 (0.064)	/atrho63	0.027 (0.064)
rho54	0.110 (0.062) *	/atrho54	0.11 (0.063) *
rho64	0.108 (0.061) *	/atrho64	0.108 (0.062) *
rho65	-0.009 (0.074)	/atrho65	-0.009 (0.074)

Note: Likelihood ratio test of rho21 = rho31 = rho41 = rho51 = rho61 = rho32 = rho42 = rho52 = rho62 = rho43 = rho53 = rho63 = rho54 = rho64 = rho65 = 0: chi2(15) = 55.8994; Prob > chi2 = 0.0000. Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1

The parameter estimates of the MVP give the likelihood of the occurrence of a given outcome. However, it cannot be quantified. Nevertheless, the marginal effect can be calculated for each model, which gives quantification of the influence of the variables (Arun & Yeo, 2020).

Table 7 presents the marginal effects of explanatory variables for the six broad adaptation categories model. In Model (1), the perception of Covid-19 as not much of a threat and dependence on transfer incomes decrease the probability of reducing consumption. However, their effects are significant at the 10% level. Also, household size increased the probability of reducing consumption. This implies that larger households decreased consumption of food and non-food items than smaller households. It is possible that larger households reduced consumption more than smaller households because of food shortages encountered during the COVID-19 pandemic, which caused serious food insecurity especially for poor households (Koos *et al.*, 2020). Furthermore, living in the northeast, northwest and southeast significantly decreases the probability of reducing consumption, and vice versa. Conversely, living in the southwest significantly increases the probability of reducing consumption.

The probable explanation for this result is that while COVID-19 affected lives and livelihoods, residence in the southwest negatively affected consumption than residence in any of southeast, northwest, and northeast zones, largely because Lagos which is in the southwest zone is also the commercial hub of Nigeria would have been affected most because of the complete lockdown. This is line with the finding of Oyekale and Oyekale (2021) who found that residence in northwest and

southeast reduced food insecurity during the Covid-19 pandemic. Expectedly, in Model (2), the probability of receiving assistance increases if the household were already transfer-dependent. This effect is statistically significant at the 1% level. Conversely, engaging in a farm enterprise, having wage employment and living in the South-south geopolitical zone statistically decrease the probability of receiving assistance. This is expected because households that were already engaged in wage employment received salaries during the Covid-19 despite not going to the offices, and those in farming were considered as producing food (an essential commodity).

It is possible that people engaged in these livelihood activities were considered to be better-off than those in other jobs (particularly those in the informal sector). Swarna *et al.* (2022) and ILO (2020) found that workers in the informal sector faced substantial income drop and least able to face the consequences of the pandemic.

In Model (3), perception of Covid-19 as a moderate and substantial threat, age, and living in the southeast and southwest statistically decrease the probability of relying on savings. Conversely, belonging to income quintiles 2, 4, and 5, relative to quintile 1, transfer-dependence, being self-employed, having wage employment, and living in the northeast, and northwest zones statistically decrease the probability of relying on savings as a coping strategy.

Table 7. Marginal effects of the factors influencing coping strategies to Covid-19 impacts in Nigeria (estimates obtained after multivariate probit).

	1	2	3	4	5	6
Variables	Reduced consumption	Received assistance	Relied on savings	Credit	Income diversification	Sale of assets
Perception (Ref. = not a threat)						

Not much of a threat	-0.191*	-0.00730	-0.0626	-0.0439	0.0725	-0.0626
	(0.0990)	(0.0735)	(0.0995)	(0.0706)	(0.0751)	(0.0753)
Moderate threat	-0.0267	0.0414	-0.180**	0.00545	0.0280	-0.151**
	(0.0753)	(0.0596)	(0.0764)	(0.0589)	(0.0537)	(0.0597)
Substantial threat	-0.0336	-0.0126	-0.142**	0.0255	-0.0120	-0.103*
	(0.0686)	(0.0533)	(0.0710)	(0.0536)	(0.0483)	(0.0573)
Age	-0.000849	0.000750	-0.00227**	-0.000871	-0.000537	-0.000156
	(0.00102)	(0.000733)	(0.000939)	(0.000800)	(0.000672)	(0.000657)
Male-headed	0.0587	-0.00921	0.0155	0.0367	0.0182	0.0344
	(0.0408)	(0.0308)	(0.0399)	(0.0352)	(0.0299)	(0.0302)
Family size	0.00896*	0.00138	0.00338	0.00489	0.00223	0.00162
	(0.00457)	(0.00331)	(0.00408)	(0.00343)	(0.00283)	(0.00278)
Education	0.0388	0.0167	-0.00147	-0.0519**	0.0131	0.00408
	(0.0285)	(0.0212)	(0.0256)	(0.0224)	(0.0180)	(0.0182)
Wealth Quintile (Ref. = Wealth quintile 1)						
Quintile 2	0.0562	0.0315	0.0912**	-0.0416	-0.00766	0.0288
	(0.0515)	(0.0383)	(0.0421)	(0.0404)	(0.0302)	(0.0280)
Quintile 3	0.0543	0.0419	0.0782*	-0.0520	0.0171	0.0274
	(0.0500)	(0.0372)	(0.0400)	(0.0396)	(0.0306)	(0.0279)
Quintile 4	0.0274	-0.0241	0.114***	-0.0298	0.0104	0.00592
	(0.0508)	(0.0358)	(0.0405)	(0.0410)	(0.0307)	(0.0284)
Quintile 5	0.0391	0.000267	0.136***	-0.0579	-0.000902	-0.00774
	(0.0524)	(0.0376)	(0.0420)	(0.0417)	(0.0314)	(0.0296)
Financial Institution	-0.00425	-0.00747	0.0358	-0.00676	-0.0178	-0.0192
	(0.0290)	(0.0219)	(0.0261)	(0.0228)	(0.0188)	(0.0191)
Farm enterprise	0.0412	-0.0501**	-0.00743	-0.000279	0.0628***	0.182***
	(0.0340)	(0.0246)	(0.0306)	(0.0263)	(0.0238)	(0.0404)
Transfer income	-0.0445*	0.149***	0.0697***	-0.0341*	0.0312*	-0.0101
	(0.0261)	(0.0188)	(0.0235)	(0.0206)	(0.0167)	(0.0166)
Self-employment	0.000629	0.00334	0.0844***	0.00587	0.0815***	0.00963
	(0.0277)	(0.0211)	(0.0255)	(0.0220)	(0.0199)	(0.0181)
Wage employment	0.0250	-0.0896***	0.0899***	-0.0517**	0.0369**	-0.0426**
	(0.0275)	(0.0212)	(0.0244)	(0.0218)	(0.0171)	(0.0182)
Location (Ref. = Rural)						
Urban	0.0131	0.0353	-0.0209	0.0193	-0.0112	-0.0553***
	(0.0304)	(0.0225)	(0.0279)	(0.0242)	(0.0198)	(0.0212)
Geographical Zone (Ref. = North central)						
Northeast	-0.132***	0.0593	0.191***	0.0654	0.0119	0.0751***
	(0.0504)	(0.0407)	(0.0494)	(0.0409)	(0.0342)	(0.0285)
Northwest	-0.131**	0.0489	0.226***	0.0553	0.00423	0.0673**
	(0.0521)	(0.0420)	(0.0508)	(0.0418)	(0.0348)	(0.0296)
Southeast	-0.117**	-0.0269	-0.120***	-0.0714**	-0.0233	0.0881***
	(0.0470)	(0.0352)	(0.0410)	(0.0334)	(0.0311)	(0.0290)
Southsouth	-0.00122	-0.0734**	-0.0380	-0.0657*	-0.0461	-0.0440**
	(0.0474)	(0.0342)	(0.0443)	(0.0346)	(0.0308)	(0.0213)
Southwest	0.135***	-0.0458	-0.115***	0.0557	-0.0350	0.0279
	(0.0446)	(0.0350)	(0.0427)	(0.0408)	(0.0321)	(0.0314)

Observations	1,421	1,421	1,421	1,421	1,421	1,421

Note: The symbols ***, **, and *, indicate that the corresponding regression coefficient is statistically significant at 1%, 5%, and 10%, respectively.

Source: Authors' estimates using World Bank (LSMS) 2020 Nigeria COVID-19 National Longitudinal Phone Survey data.

In Model (4), transfer income dependence, wage employment, and living in the southeast zone statistically decrease the probability of obtaining credit (in the form of loan or credit purchase). In Model (5), engaging in farm enterprise, being self-employment, and having wage employment statistically increase the probability of engaging in diverse income activities as a coping strategy. In Model (6), perception of the pandemic as moderate threat, wage employment, urban, and living in the south zone statistically decrease the probability of selling assets as a coping strategy. Conversely, engaging in farm enterprise, living in the northeast and southeast zones statistically increase the probability of selling assets as a coping strategy.

CONCLUSION AND RECOMMENDATIONS

This research paper used nationally representative Nigerian survey data to analyze how the COVID-19 pandemic has impacted the incomes of urban as well as rural households. Our study finds that both the pandemic outbreak and government movement restrictions have had massive disruptions on incomes reported by households in our study. Consistent with previous research, most households reported having decreased rather than increased incomes due to COVID-19. Our results suggest that pandemic-related perception and socioeconomic characteristics are associated with both decreasing and increasing income. Perception of the COVID-19 pandemic as a substantial threat to household income was significantly related to decreasing income. Furthermore, receipt of transfer payments (driven largely by friends and family) was statistically related to increasing income. This highlights the importance of providing income (social) security systems, which are expected to provide income buffers for vulnerable households. The disruptive effects of the pandemic are due, in large part, to the closure of businesses or offices due to COVID-19 restrictions, no customers / fewer customers, travel restrictions on goods for sale, closure of usual places of business, inaccessibility of inputs and need to take care of a family member, furloughs, among other reasons.

Compared to a household that had no change in income, farmers were more likely to have decreased income due to the pandemic. Unlike farmers, families that depended on transfer income were more likely to report an increase in income. This finding lends a hand to the argument in favour of increasing social transfer programs to help cushion the adverse impacts of future pandemics on household incomes. On the other hand, self-employed households were more likely to report either increased or decreased income during the pandemic. In response to the pandemic, households self-implemented strategies to cope with the deleterious effects of the COVID-19 pandemic. These strategies include reduction of household food consumption, reliance on savings, reduction of non-food consumption, assistance from friends and family, engaging in additional income-generating activities and borrowing from friends and family. The two most reported coping strategies were reduction of food consumption and reliance on savings. These pose grave danger for already poor households. First, reduction of food consumption implies negative food nutrition and security outcomes for the households. Secondly, household savings could be depleted quite quickly for poor households in the event of a long-lasting pandemic and government-imposed mobility restrictions. An analysis of the determinants of the coping strategies showed interesting results. The key results indicate that wage employment reduced the probability of requiring assistance and reduces debt burden through the reduction of credits. On the other hand, it increases the probability of relying on savings and increasing livelihood diversification. Furthermore, being self-employed increases the probability of relying on savings and increased livelihood diversification. Therefore, policy options and support facilities should be developed to foster meaningful (wage/self) employment and coping strategies to achieve optimal results in response to the pandemic

Study results suggest the following strategies to aid in stabilizing incomes, and livelihood recovery after a pandemic such as COVID-19: First, the government

needs to implement structural changes in social security schemes that consider packages that are responsive to members' needs during such crises, such as an immediate fallback position. Secondly, promoting and harnessing the savings and borrowing capacity, especially for low-income earners and rural households would provide opportunities for borrowing and restoring businesses and livelihoods after a crisis.

Finally, it should be mentioned that the data used in this study was based on a rapid online survey, as COVID-19-induced social distancing and lockdowns did not allow face-to-face interviews. This limited the amount of information collected and the generalizability of our findings. However, the data is essentially robust and provides useful information for exploring some of the immediate implications of the COVID-19 crisis, which future research involving representative and longitudinal samples or alternative survey methods can build upon and extend.

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