

RESEARCH ARTICLE

COVID-19 RESTRICTIONS COUNTERFACTUALS: AN OVERVIEW OF POSTHARVEST VALUE CHAIN ACTORS IN NIGERIA

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ABSTRACT

This investigation is borne out of the assumption that postharvest value chain actors experienced disruptions which are fallouts of the COVID-19 restrictions or otherwise. It examines the degree to which changes in livelihood and activities of postharvest value chain actors (farmers, processors, marketers, transporters and consumers) may be attributed to restrictions or the inter-play of intervening factors. The study is cross-sectional and employed the micro approach as its estimation methodology in 18 states across 6 geopolitical zones of the country. Data were obtained through key informant interviews, focus group discussions (FGDs), questionnaires and interview guides. The purposive selection of 16 states with a high incidence of COVID-19 according to the Nigeria Centre for Disease Control (NCDC) and formal restriction along with 2 states with no formal restriction as counterfactual preceded the random selection of 108,000 respondents across 5 categories of postharvest value chain actors from sampling frame provided by Agricultural Development Programme (ADP). Data components were analyzed using both descriptive and inferential statistics. Results showed that the difference in earnings was significant ($P \leq 0.05$) in restriction states but not significant ($P \leq 0.05$) in counterfactual states; the difference in expenditure on food was not significant ($P \leq 0.05$) in both restriction and counterfactual states; the difference in wages paid to work hands was not significant ($P \leq 0.05$) in both restriction and the Cross-River States, however, it was in Kogi State; the difference in number of work hands employed was significant ($P \leq 0.05$) in restriction States but not significant ($P \leq 0.05$) in counterfactual states. This implies that the restrictions affected Nigerians in general irrespective of their restriction statuses because the effects of COVID-19 2restrictions in 34 states and the FCT overshadowed the non-restrictions in 2 states.

Keywords: Expenditure, Income, Livelihood, Pandemic, Postharvest activities

INTRODUCTION

A pandemic is not a new event because mankind has faced various pandemics in history. The novel human coronavirus disease 2019 (COVID-19) was first reported in Wuhan, China in December 2019 and subsequently spread globally to become the fifth documented pandemic since the Spanish Flu 1918-1920 (WHO 2021); Asian Flu 1957-1958, Swine Flu 2009-2010, and Ebola

Pandemic 2014-2016. The virus is highly contagious and lethal, globally over 180 million infections and about 4 million deaths were recorded respectively as of June 2021 (PAHO 2021). In Nigeria, the first official case was recorded in February 2020 and since then there have been confirmed cases of the disease across 36 states including the Federal Capital Territory (Ajibo 2020).

The emergence of COVID-19 has had a

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substantial effect on health and the economy worldwide (Abrams and Szeffler 2020; Agarwal *et al.* 2022). However, in Nigeria many of the primary effects have been economic for the pandemic came at a time when Nigeria's economy was already under strain due to challenges associated with the recession, a drop in earnings from crude oil, and the overall decline in government revenue (Samuel *et al.* 2021). At the time, no vaccines or specific treatment therapies existed (Rothan and Byrareddy 2020), the Federal Government of Nigeria therefore, introduced restrictions as containment measures. There is growing recognition for studies on the impact of COVID-19 restrictions in Nigeria, as what is available is often discussed in the context of developed countries. Consequently, the fact that the pandemic is still ongoing along with its hydra-headed effects in diverse spheres, calls for a survey on how it has affected postharvest value chain actors in Nigeria.

This study compares the effect of time and movement restrictions in states where they were enforced with those where there were no restrictions. Specifically, it examines the degree to which effects/changes in postharvest value chain actors' (farmers, processors, marketers, transporters and consumers) income, expenditure, wages, and number of work hands employed may be attributed to restrictions or inter-play of intervening or concomitant factors in the restriction milieu; it gives an insight into what would have happened in the states where COVID-19 restrictions were enforced had there not been restrictions and vice versa. Fundamentally, the outcome of this investigation will contribute inputs for national planning aiming to improve response to key value chain actors' needs during difficult crisis periods. Most importantly, it will guide policy decisions regarding the management of future pandemics in the areas of establishing a post-COVID-19 data-driven new order.

METHODOLOGY

The research design is cross-sectional and employed the micro approach as its estimation methodology in 18 states across the 6 geopolitical zones of the country. The selection

of postharvest value chain actors from diverse geographical zones and states is predicated on the fact that these experienced effects of the COVID-19 restrictions in ways peculiar to their situation and location. The justification is to harvest several dimensions of the impact of the pandemic on postharvest value chain actors and their activities in Nigeria.

Data were obtained through key informant interviews, focus group discussions (FGDs), questionnaires and interview guides. A multi-stage sampling procedure was used to select respondents. Firstly, 16 states (Kano, Sokoto, Jigawa, Taraba, Bauchi, Gombe, Benue, Kwara, Ebonyi, Imo, Anambra, Lagos, Osun, Ondo, Delta, and Rivers States) with a high incidence of COVID-19 according to National Centre for Disease Control (2020) with formal restriction were purposively selected along with the 2 states (Cross-River and Kogi States) with no formal restriction or lockdown as counterfactual. Respondents were randomly selected from a pre-determined list obtained from chosen state Agricultural Development Programmes (ADPs), and relevant associations as appropriate. A total of 108,000 respondents were sampled; 6000 per state comprising 1200 each of the value chain actors of interest viz. farmers, processors, marketers, transporters, and consumers.

Data components were analyzed using both descriptive (percentages, frequencies and means) and inferential (paired sampling T-test) statistics. The estimation period was 24 months; 12 months prior to the restrictions (before) and 12 months into the restrictions (during). Data and results for restriction and counterfactual states were juxtaposed and extrapolated.

RESULTS AND DISCUSSION

Socio-demographic information

Socio-demographic information offers background information on the subject and provides the context for understanding them. The mean household size in restriction states is 6 and 5 in counterfactual states. The patriarchal reality of Nigerian society is reflected in the distribution of gender for both divides; 66 % male, 34 % female in restriction

states and 62 % male, 38 % female in counterfactual states. This suggests that the postharvest sub-sector is male-dominated and follows the typical distribution of male and female involvement in the agricultural sector (Kolawole *et al.* 2017) However, this contradicts findings by Mafimisebi, 2008 that most actors in the sector are women.

Afolami, Obayelu, and Vaughan (2015) asserted that experience exerts a major influence on the adoption and utilization of improved technologies. Actors in restriction states had an average experience of 13 years in their respective postharvest endeavour, with those in counterfactual states having 12. This indicates that actors of interest across divides are experienced. Furthermore, for restriction states, 19.24, 20.21, 41.52, and 19.03 % of actors had no formal education, primary education, secondary education, and post-secondary education respectively, while 20.7, 19.1, 49.4, and 10.8 % had no formal education, primary education, secondary education, and post-secondary education respectively in the counterfactual states. This shows that actors of interest across divides are moderately educated. Oladeebo and Masuku (2013) opined that education may directly improve productivity by enhancing the quality of labour, the ability to adjust to disequilibria, and the tendency to effectively use innovation.

In restrictions states, 10.4, 80, 6.5, 1.7, and 1.4 % of actors were single, married, widowed, divorced, and separated respectively, while in counterfactual states 14.9, 77.8, 3.7, 1.9, and 1.7 % were single, married, widowed, divorced, and separated respectively. This implies that the majority of actors of interest are married; this will most likely affect the participation of family

members in the respective postharvest enterprise (Adegbola 2019). Poverty worldwide is concentrated in rural areas (FAO & OPHI 2022; FAO 2022), that said, 57 % of actors in restriction states are ruralites, 20 % urban dwellers, and 22 % sub-urban dwellers; while counterfactual states are made up of 43.4 % ruralites, 15.4 % urban dwellers, and 41.2 % sub-urban dwellers respectively. The foregoing is a reflection of the poverty situation of the subjects of study.

Earnings from major occupation

For all actors combined (farmers, processors, marketers, transporters, and consumers) result showed a decrease in earnings for both restriction and counterfactual states during the restrictions (Table 1). However, the downturn in earnings of actors in restriction states was significant ($P \leq 0.05$) when subjected to a paired-sampled T-test (Table 2), while that of non-restriction states was not significant ($P \leq 0.05$); all actors experienced a downturn in earnings, this was, however, more severe in restriction states than in counterfactual states. Further analysis using an independent T-test (Table 8) showed that there was no significant difference ($P \leq 0.05$) between the earnings of actors in restriction and counterfactual states during the restrictions. This implies that the restrictions adversely affected the earnings of postharvest value chain actors in Nigeria irrespective of their restriction statuses.

Farmers: Paired-sampled T-test (Table 3) showed a significant ($P \leq 0.05$) downturn in earnings before and during restrictions for restriction states. For counterfactual states, however, there was a significant ($P \leq 0.05$) downturn in earnings in Kogi State while that in Cross-River State was not significant ($P \leq 0.05$). The outcome in Kogi State was similar to restriction states, while Cross-River State

Table 1: Earnings, Wages, Workhands, and Expenditure on Food

	Restriction states		Counterfactual states	
	Before	During	Before	During
Earnings from Major Occupation (₦)	56,487	37,391	48,439	35,094
Expenditure on food (₦)	10,574	10,525	12,382	12,900
Wages (₦)	3,866	1,961	1,815	1,978
Number of workhands employed	6	3	5	3

deviated. The reality of farmers in Kogi State may not be unconnected to the fact that the State which is the most centrally located in the country experienced a ripple effect of the restrictions in the 10 States that borders it.

Processors: Paired-sampled T-test (Table 4) showed a significant ($P \leq 0.05$) downturn in earnings before and during restrictions for restriction states. In counterfactual states, the downturn was not significant ($P \leq 0.05$) in Kogi State, while it was significant ($P \leq 0.05$) in Cross-River State. The outcome in Cross-River State is similar to that of restriction states, while Kogi State deviated. The

scenario observed in Cross-River State could be a consequence of the state being a notable agro-processing belt which sources a relatively sizable quantity of its raw material from other states.

Marketers, transporters, and consumers: Paired-sampled T-test (Tables 5, 6, and 7) showed a significant ($P \leq 0.05$) downturn in earnings before and during restrictions in restriction states. In both counterfactual states, however, the downturn was not significant ($P \leq 0.05$). The outcome in Kogi and Cross-River State differed from the outcome in restriction states. In other words, the earnings

Table 2: Paired-sampled T-test for all actors

	Restriction states			Counterfactual state					
	t	df	Sig. (2-tailed)	Kogi State			Cross-River State		
				t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)
Earnings from major occupation before/during restrictions	4.246	4	.013	.9	4	.40	2.2	4	.10
Wages before/during restrictions	1.195	4	.298	-3.2	3	.10	.031	3	1.00
Number of workhands employed before/during restrictions	2.974	4	.041	7.1	3	.10	1.8	3	.20

Table 3: Paired-sampled T-test for all farmers

	Restriction states			Counterfactual state					
	t	Df	Sig. (2-tailed)	Kogi State			Cross-River State		
				t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)
Earnings from major occupation before/during restrictions	7.135	5777	.000	-27.0	1	.02	6.5	1	.10
Wages before/during restrictions	9.325	4801	.000	-30.4	1	.02	.8	1	.60
Number of workhands employed before/during restrictions	49.182	4813	.000	2.0	2	.18	3.5	2	.10

Table 4: Paired-sampled T-test for all processors

	Restriction states			Counterfactual state					
	t	df	Sig. (2-tailed)	Kogi State			Cross-River State		
				t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)
Earnings from major occupation before/during restrictions	11.781	2769	.000	2.0	1	.30	18.4	1	.04
Wages before/during restrictions	.981	2186	.327	-2.1	1	.30	-.05	1	.97
Number of workhands employed before/during restrictions	32.542	2182	.000	2.0	2	.20	.7	2	.60

of actors for restriction states compared to the counterfactual show a clear-cut difference in their significance ($P \leq 0.05$) statuses; a downturn in earnings for marketers, transporters, and consumers for states with restrictions before and during was significant, this was not the case for counterfactual states with non-significant status. The most probable cause for the clear-cut difference in significance statuses is attributable to the restrictions.

Expenditure on food

During the restrictions, persons and households in restriction states witnessed a negligible decrease in money spent on food

(Table 1). However, actors in counterfactual states had a minor increase in expenditure on food during this period. Paired-sampled T-test showed (Table 7) that the change in expenditure on food was not significant ($P \leq 0.05$) for both restriction and counterfactual states. Independent T-test (Table 8) showed that there was no significant difference ($P \leq 0.05$) between expenditure on food in restriction and counterfactual states during the restrictions. This implies that persons and households in all states where the study was conducted, be it restriction or counterfactual states experienced a non-significant difference in expenditure on food no matter where they fall in the divide. This phenomenon may not

Table 5: Paired-sampled T-test for all marketers

	Restriction states			Counterfactual state					
				Kogi State			Cross-River State		
	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)
Earnings from major occupation before/during restrictions	10.879	2615	.000	6.9	1	.10	8.3	1	.10
Wages before/during restrictions	3.437	2069	.001	-2.6	1	.20	-.3	1	.80
Number of workhands employed before/during restrictions	31.606	2115	.000	1.7	2	.20	.5	2	.70

Table 6: Paired-sampled T-test for all transporters

	Restriction states			Counterfactual state					
				Kogi State			Cross-River State		
	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)
Earnings from major occupation before/during restrictions	15.685	1778	.000	.8	1	.60	2.9	1	.20
Wages before/during restrictions	6.255	1614	.000	-1.0	1	.50	-.3	1	.80
Number of workhands employed before/during restrictions	1.606	1637	.108	.866	2	.50	.000	2	1.00

Table 7: Paired-sampled T-test for all consumers

	Restriction states			Counterfactual state					
				Kogi State			Cross-River State		
	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)
Earnings from major occupation before/during restrictions	5.639	4694	.000	.4	1	.80	1.2	1	.40
Expenditure on food before/during restrictions	.262	4863	.793	-.3	1	.80	.01	1	1.00

be isolated from the fact that expenditure on food all things being equal is generally a small percentage of total earnings. Most importantly, persons and households must purchase and consume food whether there are restrictions or not. Simply put, for the reason that food is a necessity, demand and by implication expenditure on food is inelastic; that is changes in prices have a relatively small effect on the quantity of food purchased.

Wages

The result showed that there was a reduction in wages paid to work hands by actors in restriction states while there was an increase in wages paid in counterfactual states during restrictions (Table 1). However, the paired-sampled T-test (Table 2) showed that the reduction in wages paid to work hands by actors in restriction states was significant ($P \leq 0.05$). Similarly, for the counterfactual, the increase in wages was significant ($P \leq 0.05$) for Kogi State while Cross-River State was not ($P \leq 0.05$). Further analysis using the independent T-test (Table 8) showed that there was a significant ($P \leq 0.05$) difference between wages paid to work hands by actors in restriction and counterfactual states during the restrictions. This signposts that among all postharvest value chain actors and in all states, with or without official restriction, there was a difference in wages paid to work hands during the restrictions.

The scenario in Kogi State with respect to a significant increase in wages of work hands might be linked to the lull in engagement/employment; in anticipation of restriction of movement, migrant labourers (casual and unskilled workers who move about systematically from one region to another) returned en masse to their state of origin to

visit and bond with loved ones and work on personal/communal holdings. Shortly thereafter most states in the country declared a total restriction on movement that would not allow these categories of persons to return to where they were engaged as farmhands or work hands as the case may be. This situation led to the scarcity of persons who were either permanent residents or indigenes willing to work at to hitherto prevailing rate for the same task. In summary, the reality of wages paid to work hands in counterfactual states differed from that of restriction states; while wages actually reduced for the latter, wages in the former increased.

Farmers: Paired-sampled T-test (Table 3) showed a significant ($P \leq 0.05$) reduction in wages paid to work hands before and during restrictions for restriction states. For the counterfactual states, there was a significant ($P \leq 0.05$) increase in wages paid by farmers in Kogi State while this was not significant for Cross-River State. The foregoing shows what the reality would have been for wages paid to work hands by farmers for both divides; without the restrictions, farmers in states where restrictions were enforced would have experienced an increase in wages. The significance of the difference may fluctuate from state to state as it would depend on the interplay of other factors outside restrictions. Whereas, if Kogi and the Cross-River States had implemented restrictions, there would have been a significant reduction in wages paid to work hands.

Processors, marketers, and transporters: Paired-sampled T-test (Tables 4, 5, and 6) showed a significant ($P \leq 0.05$) reduction in wages paid to work hands before and during restrictions for restriction states. For the

Table 8: Independent T-test ($P \leq 0.05$): Restriction and counterfactual states

	Mean difference	Std Error difference	t	df	Sig. (2-tailed)
Earnings during COVID-19	5039.9	8865.9	0.586	8	0.586
Expenditure on food before COVID-19	-2375.00	715.89	-3.318	4	0.067
Wages paid during COVID-19	168.875	558.28	0.302	6	0.007
Number of workhands during COVID-19	-42500	0.44135	-0.963	6	0.387

counterfactual states, the increase in wages was not significant ($P \leq 0.05$). Without the restrictions, processors, marketers and transporters in restricted states would have experienced a non-significant increase in wages paid to work hands. However, if counterfactual States had implemented restrictions, there would have been a significant reduction in wages paid by processors, marketers and transporters.

Number of work hands employed

The result showed a reduction in the number of work hands employed by actors in both restriction and counterfactual states during the restriction (Table 1). However, the decline in the number of work hands employed by actors in restriction states was significant ($P \leq 0.05$) when subjected to the paired-sampled T-test (Table 2), while that of counterfactual states however was not. The distinction, therefore, lies in the magnitude of severity, that is, the decline recorded was more severe in restriction states than in counterfactual states. Further analysis using an independent T-test (Table 8) showed that there was no significant difference ($P \leq 0.05$) between the number of work hands employed by actors in restriction and counterfactual states during the restrictions. This indicates that among all postharvest value chain actors and in all states, with or without restriction, there was a reduction in the number of work hands employed during the restrictions.

Farmers, processors and marketers: Paired-sampled T-test (Tables 3, 4 and 5) showed a significant ($P \leq 0.05$) reduction in the number of work hands employed before and during restrictions for restriction states. Conversely, the reduction was not significant ($P \leq 0.05$) in both counterfactual States. Production, processing, and marketing activities in the counterfactual states continued at a rate similar if not equal to what was obtained prior to the restrictions, hence the non-significant reduction in the number of work hands employed.

Transporters: Paired-sampled T-test (Table 6) showed a non-significant ($P \leq 0.05$) reduction in the number of work hands employed before

and during restrictions. Similarly, in counterfactual states, the reduction was not significant ($P \leq 0.05$). That is to say, though transporters for both divides (restriction and counterfactual states) had a reduction in the number of work hands employed during the restrictions, this reduction was not consequential. These similarities (both the reduction in the number of work hands employed and the non-significance recorded) may be attributed to the designation of certain occupations/businesses as essential. At some point during the restrictions, transporters of food products and other agricultural commodities in all states of Nigeria received government waivers to move these essential commodities intra and interstates.

CONCLUSIONS

This investigation revealed that the pandemic affected Nigerians generally as there was little difference between states with official restrictions and those without. During the restrictions, there was no difference in earnings, expenditure on food, and the number of work hands employed between postharvest value chain actors in restriction and counterfactual states. This demonstrates that across divides, persons and households in Nigeria experienced an insignificant change in earnings, expenditure on food, and the number of work hands employed, that is, restrictions in 34 states and the FCT spawned ripple effects that transcended boundaries. The reality during this period between actors in restriction and counterfactual states with regard to wages paid to work hands was however different. That actors across the board had similar experiences with earnings, expenditure on food, and the number of work hands employed, differing only in wages paid to work hands suggests the presence of other intervening factors outside restrictions and calls for further inquiry. Similarly, further studies are required to investigate the scope, mode, and dimension of the ripple effects of restriction on counterfactual states.

AUTHOR CONTRIBUTION

AJA, PPO conceived topic, conceptualized ideas and supervised the study. AJA, OOB, OOB, LKO carried out research and collected

data. AOB, AKC analyzed data. All authors wrote the manuscript. AJA, OOB and PPO revised the manuscript.

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