Determinants of Livelihood Strategies Among Informal Food Traders in the Post-COVID-19 Pandemic Context: A South African Case Study

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Abstract: This study investigated the determinants of livelihood strategies adopted by informal food traders in Polokwane Local Municipality, South Africa, to cope with the aftermath of the COVID-19 pandemic. Primary data were collected through structured face-to-face interviews with 120 purposively sampled traders. The descriptive analysis revealed that most traders (51.7%) maintained "food trading only" as their primary livelihood strategy, while 31.7% adopted the "food trading + non-food trading" strategy, followed by 16.7% who adopted the "food trading + non-trading" (16.7%) strategy. Notably, none of the traders reported pursuing the most diversified strategy, which combines "food trading + non-food trading + non-trading." The results of the multinomial logistic (MNL) model identified several significant factors influencing the adoption of livelihood strategies. Gender, age, trading experience, shelter, government support, and supply shortages were associated with a decreased likelihood of adopting a more diversified livelihood strategy. Conversely, higher education levels, marital status, household income, a trading area, mode of transport, and possession of trading licenses were positively associated with the likelihood of adopting a more diversified livelihood strategy. Therefore, policy interventions should focus on improving access to education, infrastructure, and financial support while ensuring a more streamlined and supportive process for obtaining trading licenses. Addressing supply chain challenges and providing targeted assistance to vulnerable groups, including women and older traders, can promote resilience and economic sustainability post-COVID-19.

Keywords: informal food traders, livelihood strategies, multinomial logistic model, post-COVID-19, South Africa

Introduction

Informal food trading is a significant component of many economies, particularly in urban and low-income areas of developing countries [1,2]. It provides affordable and accessible food to communities while also offering a source of income and employment to millions of people [3–5]. Beyond its economic contributions, informal food trading serves as a critical livelihood strategy for many households [3,6], enabling them to sustain their families and contribute to community well-being [7]. Furthermore, the sector is essential in addressing food security, particularly in underserved areas where formal retail markets are often inaccessible or unaffordable [8]. However, informal food traders frequently operate under challenging conditions, including limited access to infrastructure, resources, and institutional support [9].

These constraints were further amplified by the COVID-19 pandemic, which caused widespread disruptions through lockdowns, which restricted mobility, and reduced consumer demand [10]. In response, informal traders had to adopt various livelihood strategies to cope with the challenges and restore their incomes [2,11]. In the developing world, households pursue a wide range of livelihood strategies to sustain their well-being, diversify income sources, and build resilience against economic shocks, including those triggered by COVID-19. For instance, prior to COVID-19, Gecho et al. [12] observed that while some households diversified their livelihood strategies in Southern Ethiopia, others relied on a limited number of activities. For informal traders, these strategies often included adjusting trading practices, exploring alternative income sources, and utilising available support systems to adapt and recover [3].

Despite the critical role of informal food trading in supporting livelihoods and ensuring food security, there a dearth of research on the determinants of livelihood strategies adopted by informal food traders in the post-COVID-19 era. For instance, previous studies have explored general livelihood strategies in informal trading [3,13,14], leaving a gap in understanding the specific factors that drive livelihood strategy adoption during recovery periods. To address this gap, this study investigates the determinants of livelihood strategies adopted by informal food traders in the aftermath of the COVID-19 pandemic by examining the socio-economic, physical, institutional, and legal factors underpinning the adoption of these strategies. By doing so, this study provides insights into the strategies adopted by informal food traders to cope with and recover from the COVID-19 pandemic, along with the contributing factors.

The subsequent sections of this paper are structured as follows. The next section reviews the literature on the determinants of livelihood strategies, highlighting common themes and identifying gaps in existing research. This is followed by the research methods section, which provides an overview of the case study, along with details on data collection and sampling methods. Next, the study presents descriptive results, including the socio-economic characteristics of informal food traders, followed by empirical findings on the factors influencing livelihood strategies. Finally, the conclusion summarizes the key findings, discusses their implications, and suggests areas for future research.

Literature review

Concepts definition

Informal food traders are individuals who often run unregistered businesses [2]; they sell a wide range of food commodities, including grains, prepared meals, beverages, fruits, and vegetables, among others [15]. In this study, informal food traders are defined as street vendors who are involved in trading snacks, fruits, vegetables, and cooked/prepared food.

Livelihood strategies are combination of sources of income that households or individuals engage in to maintain or enhance their livelihood [16]. These strategies are influenced by a range of livelihood assets, including human, financial, natural, physical, and social capital, which individuals utilize to overcome economic challenges and ensure stability [17]. Within the context of this study, livelihood strategies are defined as the diversification of income sources that informal food traders have adopted to enhance their livelihoods post-COVID-19 pandemic. This includes “food trading only”, “food trading and non-food trading”, “food trading and non-trading”, and a combination of “food trading, non-food trading, and non-trading”. By diversifying their income sources, traders aim to increase their economic stability and resilience, navigating a socio-economic landscape that has been significantly altered by the pandemic.

Determinants of livelihood strategies

Livelihood strategies have been a central focus in numerous studies with many examining the factors that influence their adoption. A substantial body of literature identifies various factors, including those related to socio-economic, legal, physical, and institutional aspects, as key determinants. For instance, Babulo et al. [18] investigated the determinants of rural households’ livelihood strategies in Tigray, Northern Ethiopia. A total of 360 rural households in the northern Ethiopian region of Tigray were randomly recruited to provide primary data. The primary determinants of households' choice of livelihood strategy were determined by MNL regression on asset-based explanatory variables. The findings revealed that male-headed and higher-educated households, as well as those with more land, greater access to roads (markets), and credit, were more likely to choose farming over forest collection as their primary source of income.

Expanding further, Mutenje et al. [19] investigated rural livelihood diversity as a response to economic shocks in the Southeastern Zimbabwe. The study used focus group discussions and structured interviews to collect primary data from 50 households in each of the four rural communities participating in the study. The results revealed that the household head's level of education, physical assets, cattle numbers, remittances, non-timber forestry product harvesting, and economic shocks were the main determinants of livelihood choices.

Adding to this discussion, Eneyew and Bekele [20] conducted a study on the determinants of livelihood strategies in Wolaita, Southern Ethiopia. Data were collected from 120 households using a multistage stratified sampling technique. The study utilized an MNL model to identify the determinants of livelihood strategies. Results indicated that gender, age, education level of the household head, livestock holding, land size, family size, input use, credit use, cooperative membership, dependency ratio, receipt of remittances, frequency of extension contact, and agroecology all had varying degrees of influence on household livelihood strategy choices.

Gecho et al. [12] examined factors influencing household choices of livelihood strategies in Wolaita Zone, Ethiopia, using an MNL model. The study randomly selected 300 households for interviews and found that age, sex, annual cash income, agroecology, education, livestock ownership, farm size, improved seed use, participation in social leadership, fertilizer use, and training were significant determinants of livelihood strategy choices. The study by Bekele and Rajan [21] utilised the MNL model to explore the determinants of rural households' choice of livelihood strategies in Ethiopia. A total of 140 rural households were randomly selected and interviewed. The regression model results revealed that factors such as family size, age, sex, total land size, cosmopolitanism, access to training, and participation in social leadership influenced the choice of an agricultural plus non-farm livelihood strategy. Furthermore, age, sex, family size, total land size, distance to market, annual cash income, dependency ratio, and remittances affected the choice of an agricultural plus non-farm plus off-farm strategy.

Likewise, Balense and Debebe [22] studied the determinants of rural livelihood strategies and income diversification among pastoral and agropastoral households in Southern Ethiopia. A multistage sampling technique was used to select 196 pastoralist and agro-pastoralist households. The study employed MNL regression analysis, and the results indicated that factors influencing livelihood strategies included age, sex, family size, educational level, farm size, main market distance, livestock holding size, cooperative membership, credit use, and transport access. Similarly, Amevenku et al. [23] employed the MNL model to investigate the determinants of livelihood strategies among fishing households in the Volta Basin, Ghana. A multistage sampling technique was employed to select 802 household heads. According to the results of the MNL model, the head of household's marital status, number of food shortage months experienced annually, access to credit, access to extension services, distance to regular markets and the district capital, and prior fishing experience were the main factors influencing livelihood strategies.

In another perspective, Liu et al. [24] explored livelihood resilience and its impact on livelihood strategy in China. The survey was conducted with 657 rural households, and an MNL model with principal component analysis was utilized to evaluate the influence of livelihood resilience on household strategies. The results indicated that physical capital assets and previous work experience played a significant role in household livelihood strategies for pursuing non-farming activities, whereas household size, stable income, social capital, and information sharing contributed to diverse livelihood strategies. Michael et al. [25] examined factors affecting the livelihood strategies adopted by rural residents in Nigeria. The study utilised a multistage sampling technique to select 480 residents and employed Ordinary Least Square (OLS) regression analysis to examine the determinants of livelihood strategies. The OLS results indicated that age, gender, marital status, household size, educational level, farm size, remittance, social group membership, and access to credit significantly influenced livelihood diversification.

Emeru et al. [26] investigated the determinants of urban households' livelihood diversification strategies in the North Shewa Zone, Ethiopia. The study utilised a multistage sampling technique to select 398 household heads and applied an MNL model for data analysis. The findings revealed that livelihood diversification strategies were positively influenced by factors such as the age of the household head, family size, education level, market access, credit access, and training and extension services while being negatively affected by dependency ratios. Furthermore, Zhong et al. [27] surveyed 334 farmers and herders in China using a combination of stratified random sampling and semi-structured interviews. The study evaluated public service delivery (as government support) and its impact on livelihood adaptive capacity through mediation analysis of livelihood capital. Results showed that government-supported public service delivery significantly enhanced the livelihood adaptive capacity of farmers and herders, with social and human capital being key mediators. Public service delivery also positively influenced the adoption of diverse livelihood strategies, providing critical support for sustainable livelihoods.

Patel et al. [28] investigated the relationship between social grants and livelihood strategies in South Africa. The study used a qualitative research design that included one-on-one interviews with 40 social grant beneficiaries who were purposively selected. The results revealed that social grant beneficiaries pursued multiple livelihood strategies because the grant monies were insufficient to meet their needs. The study further posits that grants provide regular income, which enables people to diversify their livelihoods, indicating the crucial role of social grants in income diversification.

Expanding on this, Workie [29] explored the determinants of livelihood diversification strategies among smallholder farmers in Ethiopia. Through a multistage sampling technique, the study selected 201 farmers and applied the MNL model. The findings underscored that age, formal education level, sex, land ownership, livestock ownership, distance from the main road, access to stable food, and credit significantly affected household livelihood diversification strategies. In a related study, Mukwedeya and Mudhara [30] utilised the MNL model to investigate the factors influencing livelihood strategy choice among youths in Zimbabwe. A total sample of 200 youths was randomly

selected. The study found that youths associated their choice of livelihood strategy with factors such as gender, age, land ownership, access to the Internet, social group membership, access to credit, and level of education.

Discussion of literature gaps

Despite extensive research on livelihood diversification in rural areas and other sectors, three gaps remain in the literature regarding informal food traders, particularly in the South African context. First, most studies have focused on farming households, pastoralists, and other rural livelihoods, leaving informal food traders largely unexamined, especially in the post-COVID-19 period. For example, the reviewed studies primarily investigated livelihood strategies within rural households, farming communities, and broader rural-urban dynamics [17–29], with none specifically addressing informal food traders. Second, none of these studies explored the strategies informal food traders adopted to cope with and recover from the economic disruptions caused by COVID-19. Consequently, this gap limits our understanding of how these traders navigated challenges such as supply chain disruptions, fluctuating consumer demand, restricted trading activities, and limited access to government support in the post-pandemic period.

Third, the existing literature on livelihood strategies and their determinants is largely centered on countries such as Zimbabwe [19,30], Ethiopia [12,18,20,21, 22, 26,29], Nigeria [25], Ghana [23], and China [24,27]. This geographical focus creates a gap in understanding how various socioeconomic, legal, physical, and institutional factors influence livelihood strategies among informal food traders in South Africa.

While one study focused on South Africa, it specifically examined the relationship between social grants and livelihood strategies in rural and peri-urban areas [28]. However, its findings cannot be directly applied to informal food traders in Polokwane Local Municipality, as the study centered on social grant beneficiaries. For instance, the livelihood strategies adopted by social grant recipients differ significantly from those employed by informal food traders in coping with and recovering from the aftermath of COVID-19. Moreover, social grant beneficiaries primarily rely on cash transfers as a safety net, whereas informal food traders must navigate business-related challenges such as fluctuating demand, supply chain disruptions, and limited institutional support. Therefore, this distinction highlights a critical knowledge gap in understanding how informal food traders adapted their livelihood strategies in response to the pandemic.

This study addresses the identified gaps in three key ways, as follows. First, unlike previous research that primarily focused on rural households and farming livelihoods, this study examines the livelihood strategies of informal food traders, particularly in the post-pandemic period. In doing so, it provides critical insights into how these traders adapted to economic disruptions and the factors that influenced their resilience. Second, since most studies on livelihood diversification have focused on countries outside South Africa, this study contributes by analyzing how socioeconomic, legal, physical, and institutional factors shape livelihood strategies among informal food traders in Polokwane Local Municipality. This localized perspective is essential for developing targeted policy interventions. Finally, by shifting the focus from farming and pastoralist communities to informal food traders, this study broadens the scope of livelihood research. Specifically, it identifies the factors that either inhibit or enable livelihood diversification within the informal food sector, offering a more comprehensive understanding of livelihood diversification among informal food traders in South Africa.

Areas of commonalities

The literature on livelihood strategies highlights a broad range of socio-economic, physical, legal, and institutional factors influencing the livelihood choices of rural households and informal traders. A key finding across various studies is the pivotal role of individual and household characteristics, such as age, gender, education, and access to resources, in shaping livelihood strategies. For instance, Babulo et al. [18] and Eneyew and Bekele [20] both identified education level, gender, and access to physical assets as significant determinants of livelihood choices. Similarly, Mutenje et al. [19] and Gecho et al. [12] highlighted that factors such as access to markets, household size, and remittances significantly affect the diversification of livelihoods in rural communities.

Studies also underscored the impact of economic shocks on livelihood strategies. For instance, studies by Liu et al. [24] and Amevenku et al. [23] demonstrated that economic resilience and the ability to adapt to economic shocks, such as those caused by the COVID-19 pandemic, are key components of livelihood strategy choice. The findings suggest that households with diversified income sources and better access to social networks and support systems are more likely to adapt to shocks and pursue diversified livelihoods. This finding resonates with the observations of Patel et al. [28], who emphasized the role of social grants in supporting income diversification. These grants provide a regular income stream, enabling households to reduce their vulnerability to economic shocks and adopt multiple livelihood strategies.

Methodology

Study area

The study was conducted in Polokwane Local Municipality, situated in the Capricorn District of Limpopo Province, South Africa. Covering an area of 5,054 km², the municipality serves as the provincial capital and economic hub of Limpopo Province [31]. Despite accounting for only 3% of Limpopo's land area, it is home to over 10% of the province's population, making it the most densely populated municipality in the district [32]. This high population density, coupled with its economic significance, justifies its selection as a study area.

Polokwane features a central economic hub characterized by a vibrant central business district, industrial areas, and formal urban settlements. These are surrounded by rapidly expanding informal settlements, driven by rural-to-urban migration [33]. Its diverse economy is supported by sectors such as community services (32.1%), finance (21.5%), wholesale and retail trade (18.3%), transport (11.7%), manufacturing (4.8%), and mining (4.2%) [31]. Informal trade plays a vital role in the local economy and serves as a critical livelihood source for many residents [33]. Strategically located at the intersection of the N1 National Road and the R101 Provincial Road, Polokwane benefits from excellent connectivity, further supported by a major railway line with ten stations within its boundaries [32]. This accessibility enhances its role as a regional economic hub and a magnet for informal trade, further emphasizing its relevance as a study area. Figure 1 below illustrates the map of the Local Municipality.

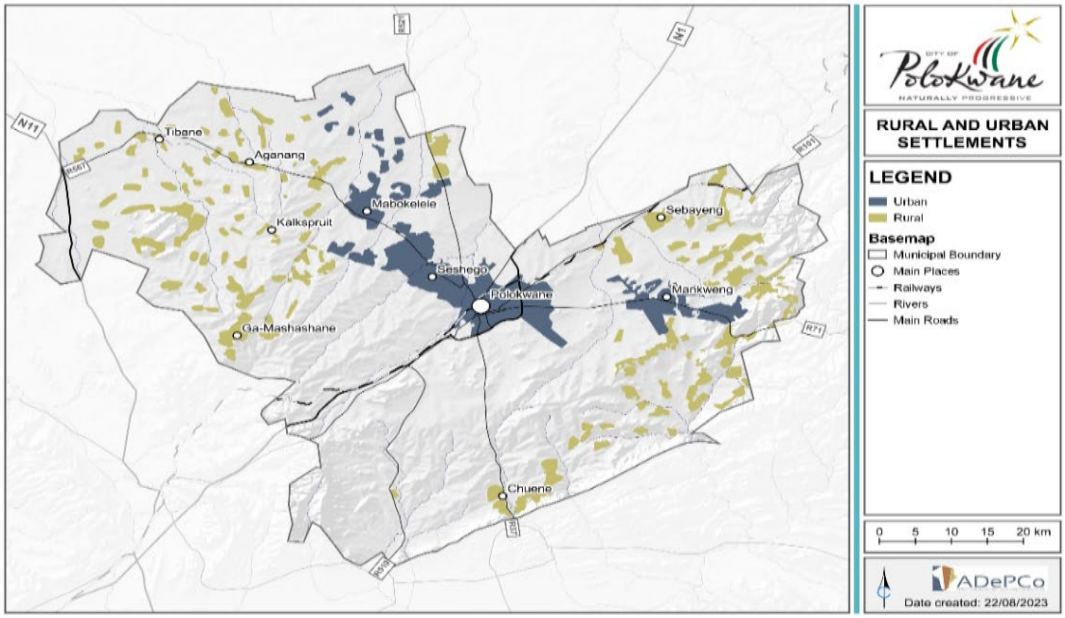

Figure 1: Polokwane Local Municipality map
Source: Polokwane Local Municipality [32]

Study design

This study employed a context-specific, cross-sectional quantitative research design to examine the livelihood strategies of informal food traders operating in high-activity street vending zones. Accordingly, this study targeted informal food traders engaged in street vending activities, focusing on areas with a high concentration of food traders, including Mankweng Unit A, Paledi Mall, Polokwane Taxi Rank, Church Street, Kruger Street, Market Street, Bok Street, and Landros Mare Street. These locations were selected based on their prominence in food trading activities, such as the sale of snacks, fruits, vegetables, and prepared foods.

To mitigate common biases associated with quantitative data collection, several strategies were employed. First, purposive sampling was used to ensure that all selected participants were actively involved in informal food trading. Second, face-to-face interviews were conducted using a structured questionnaire to minimize misunderstandings, reduce non-response bias, and enhance data accuracy. Third, direct observations of the trading environment were used to support the contextual reliability of responses to questions such as trading stalls, location, shelter, and types of goods sold.

A final sample of 120 informal food traders was selected, meeting the minimum requirement of 30 respondents for econometric analysis [34]. Data collection took place between January 20 and March 20, 2024, after the lifting of COVID-19 restrictions, when informal trading activities had fully resumed. Conducting the study during the post-COVID-19 period minimized bias from temporary disruptions and enabled the capture of livelihood strategies and trading patterns reflective of the post-pandemic context rather than the COVID-19 period itself. These design elements ensured consistency and contextual validity, thereby reducing common sources of bias in quantitative research.

Data analysis

Descriptive statistics

Descriptive statistics were conducted using the Statistical Package of Social Science (SPSS) to analyze socio-economic, legal, physical, and institutional factors that may influence informal food traders' adoption of livelihood strategies. The analysis included frequency and percentage to represent categorical variables, providing insights into the distribution of key characteristics within the sample. Additionally, measures of central tendency and dispersion; specifically, the mean, standard deviation, minimum, and maximum, were utilized to describe the variability and central trends of continuous variables. These statistical measures provided a comprehensive understanding of the factors affecting traders' ability to adopt livelihood strategies.

Multinomial Logistic Regression Model (MNL) and marginal effects

Following previous studies [23, 35, 36], this study identified four categories of livelihood strategies based on income-generating activities that informal food traders could adopt to cope with the aftermath of COVID-19. The first strategy is "food trading," for traders selling food only. The second is "food trading and non-food trading," for those selling both food and non-food items. The third strategy is "food trading and non-trading," for traders selling food while engaging in other economic activities, such as part-time work. The fourth and most diversified strategy combines "food trading," "non-food trading," and "non-trading" activities. To analyse these strategies and their determinants, this study employed the MNL Regression Model, as these strategies represent a dependent variable with more than two nominal or unordered categories [37]. The variables considered determinants, along with their descriptions and anticipated influence on the adoption of livelihood strategies, are outlined in Table 1.

Table 1: Variables' description in the MNL Regression model and their expected outcomes

Variables	Description	Type	Expected signs
	Socio-economic factors		
Gender	1 = female, 0=otherwise	Dummy	+/-
Age	0 =below 21 years, 1 = between 21 and 25 years, 2 = between 26 and 35 years, 3 =between 36 and 40	Categorical	-
Marital status	0 = married, 1= single, 2 = is divorced, 3 = widowed	Categorical	+
Nationality	1 = South African, 0 =otherwise	Dummy	+
Educational level	0=informal education, 1=primary education, 2=secondary education, 3 =tertiary education	Categorical	+
Monthly income of the household head	0=<R5000, 1=between R5000-R10000, 2 = between R10000-R15000, 3 = >R15000	Categorical	+
Other sources of income	0=receives a social grant, 1 =receives SRD Grant, 2 = receives remittance, 3 = receives pension	Categorical	+
Breadwinner	1 = sole breadwinner, 0 =otherwise	Dummy	+
Source of capital	0 = used savings, 1 = used retrenchment payment, 2 if the respondent took a loan, 3 if the respondent	Categorical	-

Trading experience	0 = trading for 0-3 years, 1= trading for 4-6 years, 2= trading for 7-10, 3> 10 years	Categorical	-
Trading hours	The number of hours in trading/day	Hours	-
Trading status	0 = full-time trader, 1 = part-time trader, 2 = casual trader	Categorical	-
Legal factors			
Trading license status	1 = acquired a trading license, 0=otherwise	Dummy	+
Contract with the supplier of goods	1 = has a contract with the supplier, 0= otherwise	Dummy	+
The period of the contract	1=full-time contract, 0=otherwise	Dummy	+
Physical factors			
Trading area	0 = Mankweng Unit A, 1 = Paledi, 2 = Kruger Street, 3 =Polokwane taxi rank, 4 = Bok Street, 5 =	Categorical	+
Marketplace for goods	0 = formal retailers/shops, 1 = from other informal traders, 2 = grows the fruits/vegetables for trading,	Categorical	+
Shelters used by traders	0 = no use shelter, 1 =umbrella, 2 = cart, 3 = container, 4 = other forms of shelter	Categorical	+
Storage facilities used for merchandise	0 = lock-up storage facilities, 1=on-site with security, 2 = on-site without security, 3 = takes	Categorical	+
Mode of transport	0 = walks to work, 1 = public transport, 2 own vehicle	Categorical	+
Institutional factors			
Government support	1 =received government support post-COVID-19 pandemic, 0=otherwise	Dummy	+
Kind of government support received	0 =once-off grant, 1 =information support, 2 = infrastructural support, 3 =skills development	Categorical	+
Social grant	1 =receives a social grant, 0=otherwise	Dummy	+
Type of social grant	0 =old age grant, 1 =child support grant, 2 = care dependency grant, 3 =grant in aid, 4 = war veteran's	Categorical	+
Municipal policy	1= trading affected by the municipal policies, 0 otherwise	Dummy	-
Kind of municipal policy	0 = trading hours policy, 1 = trading area policy, 2 = the trading area size policy	Categorical	-
Impoundment of goods	1 = goods impounded by the municipality, 0 otherwise	Dummy	-

Reasons for impoundment	0 = trading in a prohibited area, 1 =trading illegal goods, 2 = did not have a trading permit	Categorical	-
Supply shortage	0 = supply shortages, 1 = does not experience supply shortages, 2 =experiences excess supply	Categorical	+

Source: Compiled by authors

The dependent variable is represented by: Y= ("food trading only", "food trading + non-food trading", "food trading + non-trading", "food trading + non-food trading + non-trading").

Following the work of Yizengaw et al. [38], assume that for the i-th participants dealing with v options, the value of option v can be denoted as: $U_{ir} = Z_{iv}\,\beta + \varepsilon_{ir}$ (1)

If a participant selects v, then U_{ir} is the highest of the r values. As such, the empirical model is obtained from the likelihood that the option selected is v, that is:

Prob ($U_{ir} > U_{ik}$) for all others $K \neq r$ (2)

The value of the ith participant is denoted by U_{ir}, whereas the value of the ith participants from K's livelihood strategy denoted by U_{ik}. As a result, the rth of V discrete livelihood strategies, which is the one chosen by the ith informal food trader and is used to model their selection as one that maximises expected utility:

$\text{Max}_r = E(U_{ir}) = f_v\ (X_{i)} + \varepsilon_{ir}),\ r = 0, V$ (3)

Overall, the jth livelihood strategy that the ith informal food trader adopts to maximise his/her utility for an outcome variable with r categories could be assigned a value of 1, if the ith respondent adopts the rth livelihood strategy and 0, otherwise. The likelihood that an informal food trader with the attributes x selects livelihood strategy r, P_{ir}, is modelled as:

$P_{ir} = \frac{\exp(X'\beta r)}{\sum_{v=0}^{V}\exp(X'\beta r)}$, r=0; (4)

Provided that $\Sigma_{v=0}^{V}\ P_{ij} = 1$ for any i; P_{ir} is the likelihood that the ith respondent would fall into category r; Xi is a predictor of answer probabilities; and βr is a covariate effect that is exclusive to the rth response category, with the first category serving as the base. Assuming 1 = 0 is a convenient normalisation that eliminates uncertainty in the model, inferring that the generalized equation (4) is the same as:

$\Pr(y_i = j/Xi) = P_{iv=}\frac{\exp(X'\beta r)}{1+\sum_{v=1}^{V}\exp(X'\beta r)}$, for $r = 0, 1 \ldots R$ and

$\Pr(y_i = 1/Xi) = P_{i1=}\frac{1}{1+\sum_{j=1}^{J}\exp(X'\beta r)}$ (5)

In this case, y is a multiple outcome variable whose categories are coded starting at 0…… V. Note: The requirement that the J probabilities add to 1 lead to the probability of P_{i1}. This means that $P_{iv=}$ 1-∑ Pir. Like with the Binary logit model, we calculate V log-odds ratios, denoted as:

$\text{In}\left[\frac{P_{ir}}{P_{ir}}\right] = X'(\beta j - \beta V) = X'\beta r,\ \text{if } V = 0$" (6)

According to Yuya and Daba [39] the MNL coefficients are difficult to interpret and associating with the r-th outcome is tempting and misleading [40]. Instead, they argue that marginal effects provide a more meaningful interpretation by capturing the effect of an independent variable on the dependent variable in terms of probabilities. Accordingly, this study employed marginal effects to evaluate the predicted variation in the likelihood of selecting a specific livelihood strategy due to a one-unit change in an explanatory variable [12]. Following Gecho et al. [12], the marginal effects (δ_{ij}) of the likelihood's characteristics are expressed as:

$\delta tj = \frac{\partial P_t}{\partial x_t} = P_{tj}\left[\beta_{ij} - \sum_{j=0}^{j} P_{tj}\,\beta_{tj}\right] = P_{tj}[\beta_j - \beta^-]$ (7)

Where P_{tj} is the probability of an informal food trader to select tth livelihood strategies from the j category; x_t is a response likelihood predictor; and β_j represents the parameters to be calculated using the estimator of maximum likelihood. The analysis was conducted using the SPSS and Stata.

Reliability and validity testing

To enhance the credibility and robustness of the data, reliability and validity testing were undertaken. The structured questionnaire used for data collection was pre-tested with 12 informal food traders, in line with GAO [41] guidelines, to assess clarity, consistency, and relevance [42,43]. This pilot process was time- and cost-efficient and aimed at identifying and addressing potential measurement bias. Based on participant feedback, revisions were made to improve question phrasing and sequencing, contributing to a more refined and user-friendly instrument. Importantly, pilot participants were excluded from the final sample to avoid bias in the main dataset.

Furthermore, the robustness of the Multinomial Logit (MNL) model, used to identify the determinants of livelihood strategies, was assessed through the Likelihood Ratio (LR) chi-square and log-likelihood tests [44,45]. The LR chi-square test evaluated the overall statistical significance of the model, confirming that at least one predictor was meaningful. Meanwhile, the log-likelihood test was used to assess model fit, with lower values indicating better model performance. These statistical procedures validated the appropriateness of the model and enhanced the reliability of the study's empirical results.

Results and discussion

Descriptive statistics for informal food traders

To ensure robust analysis and address potential multicollinearity, the study assessed variables using Variance Inflation Factor (VIF) and Tolerance values. Most variables exhibited acceptable multicollinearity levels, while those with severe multicollinearity were excluded from the MNL regression. To simplify the dataset and minimise redundancy among several variables, Factor Analysis (FA) was performed prior to conducting MNL regression. Consequently, the discussion of descriptive statistics focuses only on the variables included in the MNL analysis, rather than all variables listed in Table 1. Table 2 presents the descriptive statistics for the variables included in the MNL regression analysis, highlighting their key characteristics and distribution.

Table 2: Descriptive statistics for informal food traders (n = 120)

Variable	Category	Frequency	Percentage (%)
Categorical Variables			
Gender	Male	44	36.7
	Female	76	63.3
Age	< 21 years	2	1.7
	Between 21 and 25 years	9	7.5
	Between 26 and 35 years	38	31.7
	Between 36 and 40	43	35.8
	>40 years	28	23.3
Marital status	Single	68	56.7
	Married	36	30.0
	Divorced	7	5.8
	Widowed	9	7.5
Nationality	South African	84	70.0
	Non-South African	36	30.0
Educational level	Informal education	12	10.0
	Primary education	18	15.0
	Secondary education	63	52.5
	Tertiary education	27	22.5
Monthly income of the household head	Less than R5000	74	61.7
	Between R5000-R10000	39	32.5
	Between R10000-R15000	4	3.3
	Above R15000	3	2.5
Breadwinner	Sole breadwinner	96	80.0

	Not sole breadwinner	24	20.0
Source of capital	Savings	55	45.8
	Retrenchment payment	6	5.0
	Loan	32	26.7
	Got assistance	19	15.8
	Remittance	8	6.7
Trading experience	0-3 years	11	9.2
	4-6 years	18	15.0
	7-10	40	33.3
	>10 years	51	42.5
Trading status	Full-time trader	107	89.2
	Part-time trader	7	5.8
	Casual trader	6	5.0
Trading license status	No trading licenses	82	68.3
	Acquired a trading license	38	31.7
Trading area	Mankweng Unit A	42	35.0
	Paledi	20	16.7
	Kruger street	9	7.5
	Polokwane taxi rank	14	11.7
	Bok Street	7	5.8
	Church Street	13	10.8
	Landros Mare	7	5.8
	Market Street	8	6.7
Marketplace for goods	Formal retailers/shops	23	19.2
	Informal traders	62	51.7
	Grows the fruits/vegetables	2	1.7
	Other places	33	27.5
Shelter	No Shelter	27	22.5
	Umbrella	41	34.2
	Cart	1	0.8
	Container	4	3.3
	Other forms of shelter	47	39.2
Storage	Lock-up storage	16	13.3
	On-site with security	9	7.5
	On-site without security	66	55.0
	Take goods home	29	24.2
Mode of transport	Walk	14	11.7
	Public	101	84.2
	own car	5	4.2
Government Support	Did not receive government support	118	98.3
	Received government support	2	1.7
Supply Shortage	Experienced supply shortage	34	28.3
	Never experienced supply shortage	61	50.8
	Excess supply	25	20.8

Continuous Variable				
Trading hours	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
	4	15	9.81	2.010

Source: Compiled by authors from survey data

The descriptive statistics results have indicated that in terms of gender, most of the respondents were female (63.3%), while a smaller proportion were male (36.7%). This highlights the predominance of women in informal food trading in the study area. Regarding age, most of the respondents were between the ages of 36 and 40 years (35.8%), followed

by those aged between 26 and 35 years (31.1%), over 40 years (23.2%), between 21 and 25 years (7.5%), and less than 21 years (1.7%). This indicates that older individuals, particularly those above 35 years, dominated informal food trading in the study area, with relatively low participation from younger traders.

In terms of marital status, most of the respondents were single (56.7%), followed by those who were married (30.0%), widowed (7.5%), and divorced (5.8%). This distribution implies that a greater proportion of informal food traders in the sample were single, with fewer being divorced. Regarding nationality, most of the respondents were South Africans (70%), while a smaller proportion were foreign nationals (30%).

The findings also revealed that a significant proportion of respondents (90.0%) had formal education, with only 10.0% having informal education. Among those with formal education, 52.5% had completed secondary education, 22.5% had completed tertiary education, and 15.0% had completed primary education. These results suggest that most informal food traders have attained at least a secondary education level, with fewer having only primary education, pointing to the accessibility of informal trading as a viable option for individuals with varying levels of educational attainment.

In terms of income, most respondents' heads of household earned less than R5000 per month (61.7%), followed by those earning between R5000 and R10000 (32.5%), R10000 and R15000 (3.3%), and above R15000 (2.5%). This indicates that a large proportion of the respondents' households lived below the median income level, with only a small fraction earning higher incomes. This may provide insight into why some individuals engaged in informal trading as a source of income or to supplement the earnings of the household head [46].

In terms of the ‘breadwinner’ variable, 80% of respondents identified themselves as breadwinners, suggesting that they were the sole providers for their households. The respondents also reported diverse capital sources, with 45.8% utilizing personal savings, 26.7% acquiring loans, 15.8% receiving assistance from family and friends, 6.7% using remittances, and 5.0% drawing from retrenchment payments. These findings imply that, due to limited access to formal financial resources, most traders relied on their savings to fund their businesses.

Concerning trading experience. most respondents (42.5%) indicated that they had been trading for more than 10 years, followed by 33.3% who had been trading for 7 to 10 years, 15.0% for 4 to 6 years, and 9.2% for less than 4 years. This suggests that most of the traders were experienced, with only a small fraction being relatively new to the industry. The study further revealed that most respondents (89.2%) were full-time traders, while 5.8% were part-time and 5.0% were casual traders. This indicates that most informal food traders dedicated themselves fully to their businesses, while fewer engaged in informal trading as a secondary activity.

In terms of acquiring a trading license, most respondents (68.3%) did not have trading licenses, while 31.7% reported having acquired one. Additionally, most respondents (63.3%) had trading contracts with suppliers, with 26.7% holding full-time contracts and 10% holding part-time contracts. These statistics suggest that while some informal food traders operated without formal documentation, a significant portion engaged in formalized trading relationships with suppliers.

Regarding the trading area of the respondents, 35.0% were from Mankweng (Unit A), 16.7% from Paledi, and 48.3% from Polokwane. Within Polokwane, 11.7% traded at the Polokwane taxi rank, 10.8% on Church Street, 7.5% on Kruger Street, 6.7% on Market Street, 5.8% on Bok Street, and 5.8% on Landros Mare Street. These results suggest that Polokwane serves as the predominant hub for informal food traders due to its role as the commercial center of the region [46].

In terms of the marketplace for goods, most respondents (51.7%) sourced their goods from other informal traders, followed by 27.5% who cooked or baked to sell, 19.2% who purchased from formal retailers, and 1.7% who grew their produce. This indicates that most informal food traders relied on the informal supply chain for their goods, while a small number produced their own goods for trade.

Regarding shelter, most respondents (39.2%) used shelters such as tin-roofed or plastic-roofed structures, while 34.2% used umbrellas, 22.5% had no shelter, and 3.3% used containers. Furthermore, most respondents (55.0%) stored their goods on-site without security, while 24.2% stored them at home, 13.3% used lock-up storage, and 7.5% stored their goods on-site with security. This implies that the lack of secure storage options may have left traders vulnerable to theft, potentially affecting their business continuity and financial stability.

In terms of mode of transport, 84.2% of respondents relied on public transport, such as mini-buses and buses, to commute to work, while 11.7% walked and 4.2% used their vehicles. The study further revealed that most respondents (98.3%) did not receive government support, although 1.7% indicated that they had received skills development

assistance. This suggests that most informal food traders did not benefit from government aid, which may limit their ability to enhance their skills or access resources necessary for business growth and resilience.

The study further revealed that 28.3% of traders experienced supply shortages, while 50.8% never faced such challenges. Additionally, 20.8% experienced excess supply, indicating that while a significant number of traders maintained stable supplies, some struggled with either shortages or an overabundance of goods.

Regarding trading hours, informal traders spent a minimum of four hours and a maximum of 15 hours operating their businesses, with an average of 9.81 hours. Informal traders who operated for four hours specialized in baking scones and fat cakes, selling them from 7 am to 11 am, as these were the most popular breakfast foods. Conversely, those who operated for 15 hours were engaged in selling cooked or prepared meals such as porridge, samp, rice, chicken feet, gizzards, and steak, among others. This indicates that the duration of trading is closely tied to the type of food offered, with breakfast foods requiring less time, while cooked meals demand longer operational hours to cater to a wider customer base throughout the day.

Multicollinearity test results

Table 3 below shows multicollinearity results, which are used to identify highly correlated variables in the MNL model using Tolerance (1/VIF) and Variance Inflation Factor (VIF). Tolerance values below 0.2 or 0.1 and VIF values above 10 indicate high multicollinearity, while VIF values between 5 and 10 suggest moderate multicollinearity, which is often acceptable [47, 48].

Table 3: Findings of the multicollinearity test

	Collinearity Statistics	
Variables	**Tolerance**	**VIF**
Gender	0.649	1.541
Age	0.459	2.179
Marital status	0.551	1.814
Nationality	0.236	4.245
Educational level	0.544	1.837
Monthly income of household head	0.544	1.839
Other sources of income	0.122	8.178
Breadwinner	0.561	1.782
Source of capital	0.749	1.334
Trading experience	0.801	1.248
Trading hours	0.667	1.498
Trading status	0.576	1.736
Trading licenses	0.705	1.418
Trading contract	0.118	8.455
Period contract	0.114	8.736
Marketplace for goods	0.596	1.678
Trading Area	0.654	1.529
Shelter	0.709	1.411
Storage facilities	0.860	1.162
Mode of transport	0.580	1.725
Government support	0.722	1.385
Social grant	0.087	11.516

Type of social grant	0.119	8.416
Municipal policy	0.094	10.661
Kind of municipal policy	0.101	9.871
Impoundment of goods	0.162	6.165
Reasons for impoundment of goods	0.171	5.832
Supply shortage	0.617	1.621

Source: Compiled by authors from survey data

The results show that most variables exhibited acceptable multicollinearity levels, with VIF values below 5 and Tolerance values above 0.2. This is excluding "social grant", with VIF of 11.516 and Tolerance of 0.087, and "municipal policy", with VIF of 10.661and Tolerance of 0.094, which exhibited severe multicollinearity. To address the multicollinearity issue, these variables were excluded from further analysis. Additionally, Factor Analysis (FA) was conducted, given many variables with potential associations, to simplify the dataset by reducing redundant variables, in line with Knafl [49] and Kyriazos and Poga [50], before proceeding with MNL regression.

Factor analysis results

Factor analysis was conducted to eliminate redundant or highly intercorrelated variables, thereby reducing the variable set. Variables exhibiting severe multicollinearity, namely "social grant" and "municipal policy," were excluded from the factor analysis to ensure the validity of the findings. Since none of the physical factors exhibited multicollinearity, factor analysis was not applied to this group. Although some variables related to legal factors (trading contracts and contract period) and socioeconomic factors (other sources of income) showed moderate multicollinearity, they did not meet the criteria for factor analysis. In contrast, factor analysis was carried out using PCA for the institutional factors, as they met the required criteria for the analysis.

Table 4 below presents the results of Barrlett's and KMO's test to assess for suitability of conducting factor analysis for institutional factors, with loadings classified as high (>0.70), moderate (0.40–0.70), or low (<0.40) [51]. The Kaiser criterion (eigenvalues >1) was applied to determine the number of factors, and variables with loadings above 0.40 were retained for inclusion in the MNL model.

Table 4: KMO and Bartlett's test results

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.518
Bartlett's Test of Sphericity	Approx. Chi-Square	200.864
	Df	15
	Sig.	<,001

Source: Compiled by authors from survey data

The results indicate that the Bartlett test of sphericity is highly significant ($p < 0.001$). Additionally, the KMO measure of sampling adequacy is 0.518, suggesting that the sample size is adequate. These findings confirm that the criteria to conduct factor analysis for institutional factors are met. Consequently, PCA was performed, and the results are presented in Table 5 below, showing eigenvalues and total variance explained for institutional factors.

Table 5: Extraction of institutional factors

Total Variance Explained						
	Initial Eigenvalues			**Rotation Sums of Squared Loadings**		
Component	Total	Variance%	% of Cumulative	Total	Variance%	% of Cumulative
1	2.044	34.060	34.060	2.037	33.952	33.952
2	1.092	18.194	52.254	1.098	18.302	52.254
3	1.000	16.666	68.921			
4	.939	15.643	84.563			
5	.823	13.721	98.284			
6	.103	1.716	100.000			
Extraction Method: PCA						

Source: Compiled by authors from survey data

The results indicate that two distinct linear components have eigenvalues greater than 1, accounting for a combined total variance of 52.254%. The first component explains 33.952% of the total variance, with an eigenvalue of 2.044, while the second component explains 18.302% of the total variance, with an eigenvalue of 1.092. Following the determination of the number of factors to retain, the Varimax rotated component matrix was applied to extract the relevant variables for further analysis, with the results presented in Table 6 below.

Table 6: Varimax rotation results for institutional factors

	Component	
	1	2
Government Support	.106	.716
Type of Social Grant		-.188
Kind of Municipal Policy	.481	
Impoundment of goods	-.950	
Reasons for impoundment	.940	
Supply Shortage		.742
Extraction Method: PCA Rotation Method: Varimax with Kaiser Normalization.		

Source: Compiled by authors from survey data

The variables, "Type of Social Grant" and "Kind of Municipal Policy" were not retained due to their low factor loadings, indicating weak relationships with the principal components. Additionally, despite their high-factor loadings, "impoundment of goods" and "reasons for impoundment" were excluded from the final analysis because they exhibited VIF values greater than 5, indicating moderate multicollinearity. Retaining these variables could have compromised the model's reliability, so their exclusion was necessary to ensure more accurate and stable results. Hence, they were removed to maintain the robustness of the analysis. Overall, variables excluded from the MNL analysis include those identified in the VIF analysis as exhibiting severe multicollinearity, those showing moderate multicollinearity, and those extracted through PCA in the factor analysis.

Results for livelihood strategies adopted by the informal food traders

Figure 2 below outlines the livelihood strategies adopted by informal food traders to cope with the aftermath of the COVID-19 pandemic. These strategies reflect the traders' efforts to navigate the economic disruptions and challenges brought on by the pandemic. Additionally, the results reveal how traders have diversified their income sources to enhance their earnings and sustain their livelihoods in the post-COVID-19 period.

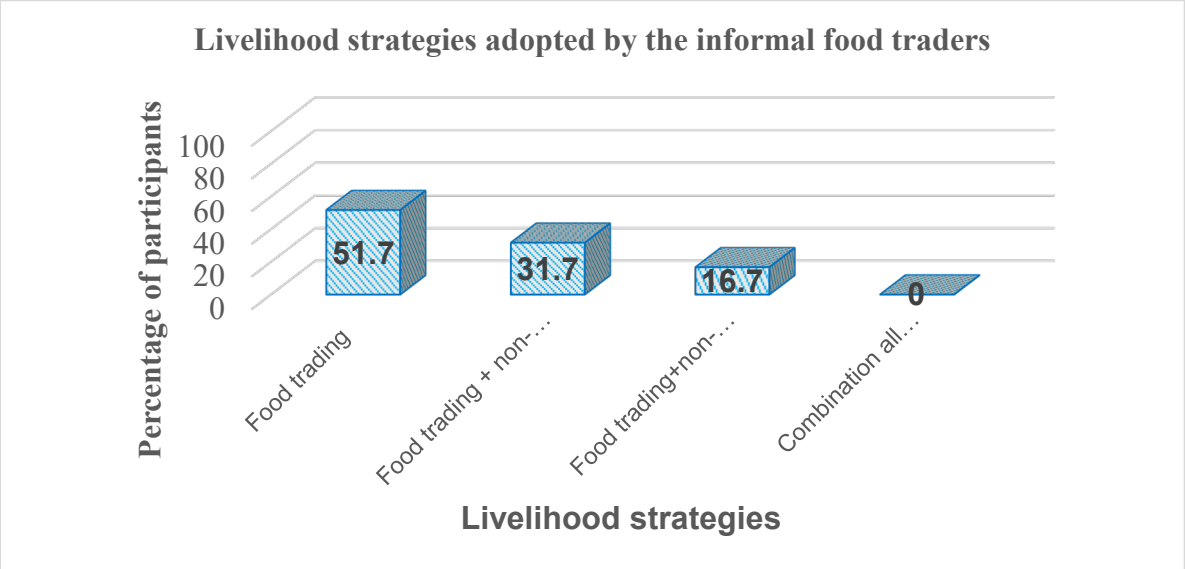

Figure 2: Livelihood strategies adopted by the informal food traders
Source: Compiled by authors from survey data

As observed from the survey results, "food trading only" is the main livelihood strategy (51.7%) adopted by informal food traders. This suggests that most traders have not diversified their income sources, making it difficult to sustain their livelihoods in the post-pandemic era. Several factors could have hindered these traders from adopting more diversified strategies [25, 26, 40, 45], highlighting their challenges and the lack of essential resources required to diversify their livelihood strategies.

Despite this, the "food trading and non-food trading" strategy is the second-most adopted livelihood strategy (31.7%), indicating that a significant proportion of traders have diversified by selling both food and non-food items. Additionally, the "food trading and non-trading" strategy ranked third, with 16.7% of traders combining food sales with other economic activities. Nonetheless, the "food trading and non-trading" strategy is the least adopted (16.7%), indicating that only a small proportion of traders have embraced multiple income streams to improve their standard of living in the post-COVID-19 era. This limited diversification is attributed to restricted access to livelihood capital resources necessary for recovery and resilience, leaving few traders able to adopt multiple strategies such as combining food trading with non-trading activities.

However, none of the respondents (0%) reported adopting a "combination of food trading, non-food trading, and non-trading" strategy. Given that the focus was on informal food traders and most traders (57.5%) pursued the "food trading only" strategy, and none of them adopted a more diversified strategy, the results suggest that many traders opted to maintain their pre-pandemic livelihood strategy instead of diversifying into other income-generating activities. This implies that most of the informal food traders may have faced barriers or lacked incentives to adopt more diversified livelihood strategies, even though diversification could potentially offer greater resilience in the aftermath of the COVID-19 pandemic. Hence, the MNL analysis aims to uncover which factors affected their adoption of livelihood strategies in the post-COVID-19 era.

MNL model results

Table 7 presents the results of the MNL model, which identified the determinants of the livelihood strategies adopted by the informal food traders. The dependent variable, representing livelihood strategies, is assumed to have no natural ordering, with "food trading only" selected as the reference category, as it was the most common strategy (51.7%). The combination of "food trading, non-food trading, and non-trading" strategy was excluded from the analysis, as no respondents reported adopting this strategy. Out of the 29 variables, 19 were included for further analysis.

To provide further insights, a marginal effects analysis was performed, quantifying the probability of adopting specific livelihood strategies in response to changes in predictors. The results align with theoretical expectations, with the marginal effects summing to zero across the three livelihood strategies and the predicted probabilities summing to one. These probabilities, expressed as percentages, are discussed alongside the MNL findings to offer a comprehensive view of how significant variables influence the adoption of livelihood strategies, as shown in Table 8.

Table 7: MNL model results

LR chi2(38) =61.45 Prob > chi2 = 0.0094 Log likelihood = -80.047261 Pseudo R-Square: Cox and Snell 0.567 : Nagelkerke .654 : McFadden .416			
Variables	**Coefficients**	**Standard**	**P-value**
Food trading + non-food trading livelihood strategy			
Gender	-0.493	0.260	0.058*
Age	-0.683	0.330	0.038**
Marital status	0.639	0.338	0.059*
Nationality	0.028	0.567	0.960
Educational level	0.944	0.369	0.011**
Monthly household income	0.168	0.489	0.731
Breadwinner	0.395	0.737	0.592
Source of capital	-0.133	0.199	0.506
Trading experience	-1.081	0.488	0.027**

Trading hours	0.014	0.098	0.891
Trading status	-0.660	0.748	0.378
Trading license	-0.061	0.514	0.906
Marketplace for goods	-0.026	0.242	0.914
Trading area	0.147	0.074	0.048**
Shelter	-0.284	0.169	0.093*
Storage	-0.262	0.249	-0.293
Mode of transport	0.071	0.287	0.804
Government support	-0.709	0.330	0.032**
Supply Shortage	-0.613	0.255	0.016**
Food trading + non-trading livelihood strategy			
Gender	-0.282	0.158	0.074*
Age	-0.432	0.583	0.458
Marital status	0.550	0.701	0.432
Nationality	-1.155	1.223	0.345
Educational level	1.305	0.784	0.096*
Monthly income of household head	1.816	0.977	0.063*
Breadwinner	0.535	1.251	0.669
Source of capital	-0.306	0.283	0.279
Trading experience	-0.061	0.514	0.906
Trading hours	-0.262	0.156	0.094*
Trading status	-0.511	0.733	0.486
Trading license	-2.161	0.935	0.021**
Marketplace for goods	-0.016	0.471	0.972
Trading area	0.056	0.112	0.618
Shelter	-0.383	0.314	0.223
Storage	-0.077	0.404	0.848
Mode of transport	1.112	0.400	0.005***
Government support	-1.198	0.381	0.002***
Supply Shortage	-0.186	0.362	0.608

Note: p*<0.1; **p<0.05, *** p<0.01

Source: Compiled by authors from survey data

Table 8: Marginal effects findings

Livelihood strategies	**Food trading only**	**Food trading + non-food trading**	**Food trading + Non-trading**
Predicted probability	0.571	0.317	0.112
Variables	**Marginal effects**		
Gender	0.142	-0.111	-0.031
Age	0.111	-0.106	-0.005
Marital status	-0.109	0.095	0.014
Educational level	-0.175	0.124	0.051
Monthly household income	-0.079	-0.030	0.109
Trading experience	0.076	-0.058	-0.018

Trading hours	0.006	0.011	-0.017
Trading license	0.075	0.056	-0.131
Trading area	-0.028	0.031	-0.003
Shelter	0.052	-0.038	-0.014
Mode of transport	-0.074	-0.025	0.099
Government support	0.200	-0.124	-0.076
Supply shortage	0.099	-0.111	0.012

Source: Compiled by authors from survey data

Quantitative parameters and their statistical interpretation

The MNL model results are quantitative, as demonstrated by the model parameters in Table 7 and the marginal effects findings in Table 8. Specifically, Table 7 presents numerical coefficients, standard errors, and p-values that identify statistically significant predictors of livelihood strategy choices among informal food traders. The model's Likelihood Ratio chi-square (LR $chi^2(38) = 61.45$, $p = 0.0094$), log-likelihood (-80.047), and Nagelkerke R^2 (0.654) provide validation of the MNL results. Marginal effects in Table 8 quantify the influence of individual variables on livelihood strategy probabilities, thereby enabling evidence-based interpretations. These statistical results form the foundation for deriving conclusions grounded in verifiable relationships rather than subjective judgements, thereby minimizing internal bias commonly associated with qualitative data.

Validation of the MNL results

The MNL results were validated through multiple statistical tests assessing goodness-of-fit and explanatory power. The likelihood ratio chi-square statistic (LR $chi^2(38) = 61.45$, $p = 0.0094$) indicates that the model is statistically significant at the 1% level. In line with Mafukata [44] and Duressa [45], this confirms that at least one predictor significantly explains variation in livelihood strategy choices among informal food traders Moreover, the Nagelkerke R^2 value of 0.654 indicates that 65.4% of the variance in livelihood strategies is explained by the model.

The model produced a log-likelihood value of -80.047, with lower (less negative) values indicating a better model fit. Pseudo R-squared statistics, such as Cox and Snell $R^2 = 0.567$, Nagelkerke $R^2 = 0.654$, and McFadden $R^2 = 0.416$, demonstrate a moderately strong model, with the McFadden R^2 exceeding the commonly accepted threshold of 0.2 for decent model performance [52,53]. Additionally, the Wald chi-square statistics were significant at the 1% level. This confirms the explanatory power of the included variables. Furthermore, the sum of the marginal effects across the three categorized livelihood strategies equals zero, while the predicted probabilities sum to one, further supporting the internal consistency and validity of the model. Importantly, 12 of the 19 predictor variables were statistically significant. Below is a discussion of the significant variables.

Discussion of significant results

Socioeconomic factors

Gender

As anticipated, the gender variable is negative and statistically significant at the 10% level for both the "food trading + non-food trading" strategy and the "food trading + non-trading" strategy. The negative coefficients for both strategies imply that females are less likely than males to pursue these diversified livelihood strategies compared to the "food trading only strategy. The marginal effects for gender reveal that being female decreases the probability of adopting the "food trading + non-food trading" strategy by 11.1% and the "food trading + non-trading" strategy by 3.1% relative to the "food trading only" strategy. This highlights the significant role gender plays in livelihood diversification, with females being less likely to diversify into non-food trading or combine trading activities, likely due to socio-cultural constraints and limited opportunities. These findings are in line with the findings of Gecho et al. [12] for 300 rural households in Ethiopia.

Age

In line with prior expectations, the age variable is negative and statistically significant at the 5% level for the "food trading + non-food trading" strategy. The negative coefficient implies that older traders are less likely than younger ones to diversify their livelihoods into food and non-food trading activities compared to the "food trading only" strategy. The marginal effect for age reveals that each additional year of age decreases the probability of adopting the

"food trading + non-food trading" strategy by 10.6%. This illustrates the crucial role age plays in livelihood diversification, with older traders being less likely to diversify into food and non-food trading activities, as they often resist innovation and prefer familiar trading methods. These findings are consistent with the findings of Yuya and Daba [40] for 180 smallholder farmers in Ethiopia.

Marital status

Contrary to prior expectation, the marital status variable is positive and statistically significant at the 10% level for the "food trading + non-food trading" strategy. The positive coefficient suggests that single traders are more inclined than others (married, divorced, and widowed) to pursue this diversified livelihood strategy compared to the "food trading only" strategy. The marginal effect of 0.095 suggests that being single increases the probability of adopting this strategy by 9.5%. This highlights the vital role marital status plays in livelihood diversification, with single traders more likely to diversify their livelihoods into food trading and non-food trading activities, as they may have fewer household obligations, allowing for greater flexibility in managing multiple trading ventures. These results contradict the findings of Michael et al. [25] for 480 rural households in Nigeria.

Educational level

As anticipated, the educational level variable is positive and statistically significant at the 5% level for the "food trading + non-food trading" strategy and the 10% level for the "food trading + non-trading" strategy. The positive coefficients imply that educated traders are more likely than those with lower education to pursue these diversified strategies relative to the "food trading only" strategy. The marginal effects suggest that higher education increases the probability of adopting the "food trading + non-food trading" strategy by 12.4% and the "food trading + non-trading" strategy by 5.1%. This demonstrates the significant role educational level plays in livelihood diversification, with highly educated traders more likely to adopt diversified trading activities, as they are equipped with a variety of abilities and information. The results align with the findings of Hoq et al. [54] for 300 households in Bangladesh.

Monthly income of the household head

As expected, the monthly income of the household head variable is positive and statistically significant at the 10% level for the "food trading + non-trading" strategy. The positive coefficient suggests that traders from higher-income households are more likely than those with lower incomes to pursue the "food trading + non-trading" strategy compared to the "food trading only" strategy. The marginal effect shows that an increase in household income increases the probability of adopting this strategy by 10.9%. This demonstrates the significant role that the monthly income of the household head plays in livelihood diversification, with higher-income households more likely to adopt multiple trading activities, as they may have greater financial flexibility, consistent with the finding of Duressa [45] for 292 households in Ethiopia.

Trading experience

In line with prior expectations, the trading experience variable is negative and statistically significant at the 5% level for the "food trading + non-food trading" strategy. The negative coefficient implies that experienced traders are less likely than those with less experience to pursue the "food trading + non-food trading" strategy compared to the "food trading only" strategy. The marginal effect implies that more experience reduces the probability of adopting the "food trading + non-food trading" strategy by 5.8%. This demonstrates the significant role trading experience plays in livelihood diversification, with more experienced traders less likely to diversify their livelihoods into food trading and non-food trading activities, as they may be older and tend to make fewer efforts to diversify their income sources. These findings are consistent with the findings of Duguma et al. [55] for 400 smallholder farmers in Ethiopia.

Trading hours

As expected, the trading hours variable is negative and statistically significant at the 10% level for the "food trading + non-trading" strategy. The negative coefficient suggests that traders who work long hours are less likely than those who work fewer hours to pursue the "food trading + non-trading" strategy compared to the "food trading only" strategy. The marginal effect indicates that working long hours reduces the probability of adopting the "food trading + non-trading" strategy by 1.7%. This demonstrates the significant role trading hours play in livelihood diversification, with traders working long hours less likely to diversify their livelihoods into food trading and non-trading activities, due to having limited time to diversify their income sources, aligning with the results of Khumalo [56] for 100 informal traders in South Africa.

Legal factors

Trading license

Contrary to prior expectations, the trading license variable is negative and statistically significant at the 5% level for the "food trading + non-trading" strategy. The negative coefficient implies that traders without licenses are more likely than licensed traders to pursue this strategy compared to the "food trading only" strategy. The marginal effect suggests that having a trading license decreases the probability of adopting this strategy by 13.1%. This highlights the crucial role that trading licenses play in livelihood diversification, with licensed traders less likely to diversify their livelihoods into food trading and non-trading activities. This is possibly due to regulatory restrictions that limit flexibility in diversifying their livelihoods, contradicting Mago [3]'s findings for 125 informal traders in South Africa.

Physical factors

Trading area

In line with prior expectations, the trading area variable is positive and statistically significant at the 5% level for the "food trading + non-food trading" strategy. The positive coefficient suggests that traders in Mankweng Unit A are more likely than those trading in other areas (such as Paledi, Kruger Street, Church Street, Market Street, Landros Mare Street, Bok Street, and Polokwane Taxi Rank) to adopt the "food trading + non-food trading" strategy compared to the "food trading only" strategy. The marginal effect shows that trading in Mankweng Unit A increases the probability of adopting the "food trading + non-food trading" strategy by 3.1%. This highlights the significant role that trading areas play in livelihood diversification, with traders operating in Mankweng Unit A more likely to diversify into both food and non-food trading activities, likely due to the presence of various retail shops, transport hubs [57], and proximity to the University of Limpopo.

Shelter

Contrary to prior expectations, the shelter variable is negative and statistically significant at the 10% level for the "food trading + non-food trading" strategy. The negative coefficient indicates that traders having no shelter are more likely than those owning shelter to pursue the "food trading + non-food trading" strategy compared to the "food trading only" strategy. The marginal effect indicates that owning a shelter decreases the probability of adopting the "food trading + non-food trading" strategy by 3.8%. This highlights the critical role that shelter plays in livelihood diversification, with traders owning shelter less likely to diversify their livelihoods into both food trading and non-food trading activities, likely due to limited resources such as finance, contradicting Mukwedeya and Mudhara [30]'s findings for 200 youth in Zimbabwe.

Mode of transport

As anticipated, the mode of transport variable is positive and statistically significant at the 1% level for the "food trading + non-trading" strategy. The positive coefficient implies that traders using public transport to work are more likely than those walking and using their cars to pursue the "food trading + non-trading" strategy compared to the "food trading only" strategy. The marginal effect reveals that using public transport to work increases the probability of adopting the "food trading + non-trading" strategy by 9.9%. This highlights the significant role the mode of transport plays in livelihood diversification, with traders using public transport to work more likely to diversify into both food and non-food trading activities, likely due to lower transport costs and easier access to their workplace. These results are consistent with the findings of Balense and Debebe [22] for 196 households in Ethiopia.

Institutional factors

Government support

Contrary to expectations, the government support variable is negative and statistically significant at the 5% level for the "food trading + non-food trading" strategy, and at the 1% level for the "food trading + non-trading" strategy. The negative coefficients for both strategies imply that traders receiving government support are less likely than those not receiving government to pursue these diversified livelihood strategies compared to the "food trading only" strategy. The marginal effect for government support reveals that receiving government support decreases the probability of the "food trading + non-food trading" strategy by 12.4% and the "food trading + non-trading" strategy by 7.6% relative to the "food trading only" strategy. This highlights the crucial role government support plays in livelihood diversification, with traders receiving support being less likely to diversify their livelihoods into food and non-food trading or combined trading activities. This may be due to reliance on government support, which can discourage them from diversifying their income, in contrast to findings for 334 farmers and herders by Zhong et al. [27] in China.

Supply shortage

Contrary to expectations, the supply shortage variable is negative and statistically significant at the 5% level for the "food trading + non-food trading" strategy. The negative coefficient indicates that traders who experience supply shortages are less likely to pursue the "food trading + non-food trading" strategy compared to the "food trading" strategy. The marginal effect reveals that experiencing supply shortages decreases the probability of adopting this strategy by 11.1%. This highlights the crucial role that supply shortages play in livelihood diversification, with traders facing shortages being less likely to expand their trading activities, contradicting the findings of Duma and Utete [58] in South Africa.

Limitations

While this study employed robust quantitative methods to analyze livelihood strategies among informal food traders, it is important to acknowledge the inherent limitations and internal biases associated with quantitative data. These include response biases, measurement errors, and sampling limitations, as this study involved informal sector participants who may underreport or misrepresent information due to mistrust, legal constraints, or fear of regulatory consequences. Although efforts were made to mitigate such biases, through purposive sampling, structured face-to-face interviews, pilot testing of the questionnaire, and validation of the MNL model, these strategies cannot entirely eliminate the influence of context-specific and respondent-related distortions. As such, the conclusions drawn should be interpreted as reflective of the sampled population within the Polokwane Local Municipality rather than broadly generalized to all informal traders in South Africa. predominant livelihood strategies adopted by informal food traders in the post-COVID-19 period and the key factors influencing these choice. However, further research using mixed methods could enhance the depth of understanding by capturing perspectives and motivations that quantitative tools may overlook. Therefore, policymakers and practitioners should consider the findings as evidence-based and context-specific, making them valuable for guiding local interventions as well as for comparisons in similar informal economies.

Conclusion

This study investigated the livelihood strategies adopted by informal food traders in the Polokwane Local Municipality in the post-COVID-19 era. The analysis aimed to identify the predominant strategies and the factors influencing their adoption. The findings revealed that most traders (57.5%) maintained a "food trading only" strategy, while 31.7% pursued a "food and non-food trading" strategy, and 16.7% opted for a "food and non-trading" strategy. Notably, no trader reported adopting a combination of "food trading, non-food trading, and non-trading" strategy. These suggest that most informal food traders maintained their pre-pandemic livelihoods rather than diversifying, likely due to barriers or insufficient incentives to explore other income-generating activities, despite the potential benefits of a more diversified strategy.

The MNL analysis provided deeper insights into the factors shaping the adoption of livelihood strategies. Variables such as gender, age, trading experience, trading hours, possession of a trading license, access to shelter, government support, and supply shortages negatively and significantly influenced the adoption of multiple livelihood strategies. This indicates that female traders, older individuals, experienced traders, and those trading longer hours were less likely to diversify their livelihoods. Similarly, traders with access to shelter, government support, or trading licenses also showed limited diversification. In contrast, marital status (single), higher educational attainment, higher household income, use of public transport, and operation in Mankweng Unit A positively influenced the adoption of multiple strategies, highlighting the role of socioeconomic, legal, physical, and institutional factors in promoting livelihood diversification.

Based on these findings, targeted policy interventions are recommended to promote livelihood diversification and resilience among informal food traders. Mentorship and peer support programs should be developed to encourage older traders and those with extensive experience to explore diversification opportunities through knowledge exchange and skill-building. Tailored training workshops focusing on market trends, digital marketing, and non-food trading options could further equip traders to expand their income streams. Simplifying the licensing process, such as introducing a fast-track system with reduced fees and grace periods, could motivate more traders to formalize their businesses. Additionally, strengthening supply chain resilience through partnerships with local farmers, investments in market infrastructure like storage facilities, and improving access to fresh produce could reduce supply shortages and enhance business sustainability.

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