Keeping Food on the Table: Urban Food Environments in Nairobi under COVID-19

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Abstract

The COVID-19 pandemic has spread rapidly around the world since late 2019. Measures taken to curb infection rates—curfews, border closures, closure of markets, and movement restrictions—have disrupted food systems and affected food environments. There is limited evidence of the effects of the pandemic on food environments, especially in the informal neighborhoods/slums of urban towns or cities. This study characterizes the food environment (formal and informal outlets) in low- and middle-income urban neighborhoods of Nairobi, Kenya during the current COVID-19 pandemic. It also analyses the social economic effects of government measures, taken to curb the pandemic, on different types of food outlets in these communities. The study uses primary data collected in December 2020 from 1,005 food vendors (543 located in slums and 462 in non-slum areas). Survey questions focused on business characteristics and the food commodities traded, food safety, COVID-19 awareness, and the effects of the pandemic on their businesses. Data on price trends before COVID-19, during lockdown, and post-lock down were collected using recall and analyzed using descriptive analyzes. About 90% of traders in both slum/non-slum locations are informal vendors. Fresh vegetables are the most traded food commodities with significantly higher numbers of fresh vegetable vendors in slum than non-slum areas. More non-slum vendors are sensitive to food safety concerns than slum vendors. Government measures to reduce the spread of COVID-19, such as curfews and lockdowns, have negatively affected businesses in both slum and non-slum locations. More slum businesses were significantly affected by curfews compared to non-slum ones. Prices for almost all food commodities increased between the period before COVID-19 (December 2019) and first lockdown period (April–August, 2020) and then decreased again post lockdown (August–December, 2020). Price increments are observed during lockdowns for most commodities with greater increases seen for the vendors in the slums compared to those in non-slum locations.

Key words: COVID-19; urban food environment; slum and non-slum vendors; Kenya; Africa

Fresh fruits and vegetables on display in a kiosk in Kibera. Credit: Alliance of Bioversity and CIAT/K. Onyango).

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1. Introduction

The COVID-19 pandemic has disrupted food systems globally over the past year. In an attempt to curb the pandemic's spread, governments worldwide have implemented a series of containment measures, most of which have negatively impacted food distribution and affordability (UN, 2020). Like governments in many other countries, the government of Kenya has repeatedly imposed measures, including nationwide dusk-to-dawn curfews, social distancing, border closures, closure of traditional markets, learning institutions and places of worship, and restriction of movement into or outside of regions with high infection rates (MoH, 2020). While such measures are aimed at minimizing the spread of COVID-19, they are disrupting food systems and directly affecting food environments by creating access barriers and causing repercussions on affordability, especially in urban areas and among poor populations (Chege et. al., 2020; GAIN, 2020). For example, measures to close or reduce the operations of informal food retail outlets have affected the availability and affordability of food for low-income urban consumers, who mostly purchase their food in small quantities from informal vendors and open-air markets (FAO, 2020a).

The food environment is at the nexus between production systems and consumers. It is the context in which consumers interact with food and what influences consumers' choices, within the wider food production and distribution system (Turner et al., 2017; FAO, 2016). The food system encompasses key elements such as food availability, accessibility, affordability, desirability, convenience, and marketing (Herforth and Ahmed, 2015). These key elements can be classified into two domains: the external food environment, which includes the exogenous dimension (e.g. food availability, prices, vendor typology, product properties, marketing, and regulation) and the personal food environment, which includes endogenous dimensions (e.g. food accessibility, affordability, convenience, and desirability) (Turner et al., 2017). Food environment affects consumers' food choices and dietary preferences, principally determined by what is available, affordable and easily accessible in the markets (Herforth and Ahmed, 2015). Consumers are more likely to

spend their incomes on healthy diets in a food environment where healthy foods are available, affordable and easily accessed. Similarly, a food environment that supplies unhealthy foods, such as highly processed foods that are easily available and affordable, is likely to have a negative influence on consumers' diets (Bodor et al., 2008; Herforth & Ahmed, 2015).

The effects of the food environment on consumers' diets are likely to be greater in urban areas compared to rural areas. Diets in rural areas are influenced by production and food markets. According to Muthini et al. (2020a) and Shibahtu & Qaim (2018), production diversity is positively correlated with household dietary diversity, however, Ayenew et al. (2018) argues that production diversity improves household dietary diversity only during post-harvest season but not during post-planting season. Muthini et al., (2020b) and Matita et al., (2021) further indicates that rural households that participate in food markets are more likely to have better diets. Unlike in rural areas, urban areas are mostly influenced by food markets only. In urban areas the food environment has been rapidly changing, which has affected urban consumers' diets quality and choices. In sub-Saharan Africa, the growing presence of supermarkets in urban areas has, on one hand, improved access to diverse food at affordable prices (Rischke et al., 2015) and, on the other, increased access to more processed and energy-dense foods, leading to over-nutrition (obesity) (Popkin, 2017; Kimenju et al., 2015; Demmler et al., 2018). However, Berger & Helvoirt (2018) argue that it is mostly middle- and high-income consumers who benefit from improved access to food, and they are already food secure. Demmler et al. (2018) note that the use of supermarkets increases with increased household income. Therefore, despite the modernization of retail food outlets in the urban areas of sub-Saharan Africa, the impact of supermarkets on low-income urban consumers' diets is limited. About 60% of low-income urban consumers are malnourished (UN-HABITAT, 2010) and informal food retailers remain their main source of food provisions (Chege et al., 2021; Wanyama et al., 2019).

How and to what extent these informal vendors have been affected by the ongoing COVID-19 pandemic is still unclear. Evidence shows that government restrictions has limited consumers' access to food (GAIN, 2020). The challenges of limited access to food supplies are especially marked in cities and among lower-income populations and migrant workers (GAIN, 2020). Studies conducted with consumers in Ethiopia and India show a declining trend in consumption of high-value, nutritionally dense foods like fruits, vegetables and animal-source products (Harvard, 2020; Hirvonen et al., 2021; Tamru et al., 2020). Similarly, in Kenya, vegetable and fruit vendors report reduced sales and price increases for some fruits and vegetables (GAIN, 2020). This is reflected in another study that show a reduced consumption of fresh fruits and vegetables among low- and middle-income urban consumers in Kenya (Chege et al., 2020). This reduced consumption negatively affects household dietary diversity, particularly among low-income urban consumers (Chege et al. 2020). Loss of income also has a direct consequence on consumption patterns. Most urban dwellers depend on casual labor and informal sector jobs (including food vendors), living hand to mouth and with limited or no savings. COVID-19 containment measures such as lockdowns, restriction of movement, curfews and social distancing have disrupted their jobs leading to a loss of livelihoods and reduced incomes (FAO, 2020a). Results from a nationwide telephone survey conducted in Kenya showed that about 30% of the respondents were absent from work because of temporary layoffs or a temporary slack determined by technical or economic reasons (KNBS, 2020). In Ethiopia, income loss was more likely to be reported by less-wealthy than wealthier households (Hirvonen et al., 2021).

In an effort to understand the consequences of the COVID-19 pandemic for the food systems and dietary habits in Africa, studies have been conducted focusing on specific parts of the food system, in particular on understanding the effects of COVID-19 on household consumption and food security (Kansiime et al., 2021; Chege et al., 2020; Hirvonen et al., 2021; Tamru et al., 2020). Several other studies have assessed the effects of the pandemic on different agricultural value chains (Morton, 2020; Tesfaye et al., 2020; Nchanji et al., 2021; Fang et al., 2021). While these studies provide insights into the interventions needed to improve and increase the resilience of different parts of the food system, there is still limited evidence of the pandemic's effects on urban food environments, especially in informal settlements/slums[1] of towns or cities. To provide evidence of the effects of COVID-19 on low- and middle-income urban food environment, this study aims to: (i) characterize the food environment (formal and informal outlets) during the COVID-19 pandemic, and (ii) analyze how the food environment has been affected by both the pandemic and the government measures put in place to curb the pandemic.

1 Informal settlements are defined as settlements characterized by: lack of structured planning, insecure claims of property ownership, inadequate service provisioning, and unhealthy environmental conditions, (Ananga et al., 2017).

2. Data and study sites

This study uses primary data collected in December 2020 from vendors in low- and middle-income neighborhoods of Nairobi. Nairobi was selected because it is one of the largest cities in East Africa and the most urbanized in Kenya. More than 50% of the Nairobi population is estimated to live in informal settlements (Amnesty International, 2019). Furthermore, Nairobi is one of the cities in Kenya that has been most severely affected by the pandemic and where the government has continued to put in place measures to reduce the spread of the pandemic. (Government of Kenya, 2021).

Data were collected in four study locations: two slums (*Kibera* and *Mathare*) and two non-slum locations (*Dagoretti Corner* and *Donholm*), as shown in Figure 1. The study targeted formal (supermarkets and grocery stores) and informal outlets (kiosks, mom and pop shops, tabletop vendors (locally known as *mama mbogas*), butchers and open-air markets). A systematic random sampling approach was used, in which the research team interviewed every 5th outlet of the selected type in each of the study sites. Where there were fewer outlets of each category—e.g. supermarkets and grocery stores in the slums—all available outlets of that type were surveyed. We employed a snowball approach to identify open-air markets from which foods for the study locations are sourced. Where retail vendors mentioned wholesalers or retailers from certain open-air markets as their suppliers, we targeted those markets for study and a few wholesalers and retailers were interviewed. In total, 1,005 food vendors were interviewed, 543 in the slums and 462 non-slum locations. The target respondent at the food outlets was either the owner or the outlet operator, provided that the latter had sufficient information about the outlet's business operations.

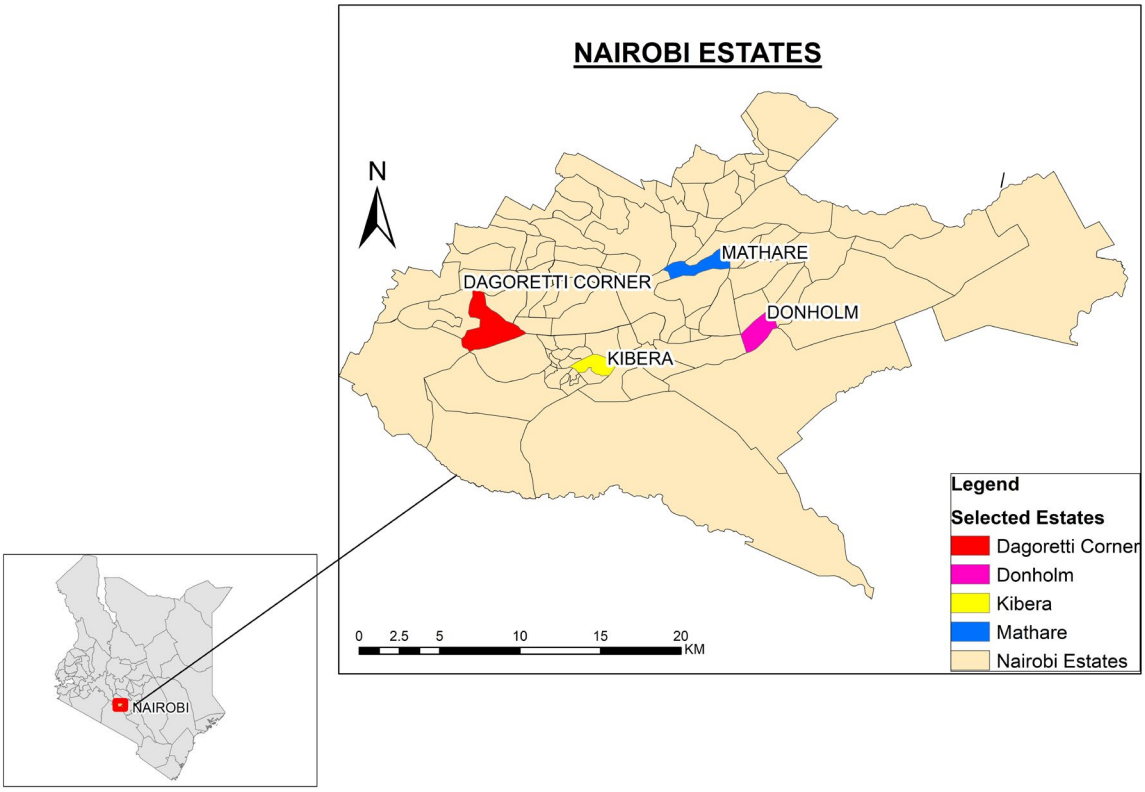

Figure 1. Map of the study locations (Dagoretti corner, Donholm, Kibera, and Mathare).
Source: Generated by the authors

We collected food-environment data through a face-to-face survey using structured questionnaires programmed in Computer-Aided Personal Interviewing (CAPI) technology. All Kenyan Ministry of Health COVID-19 rules and requirements were observed during the data collection. The questionnaires were tested with urban consumers by the research team prior to the actual surveys. Data enumerators were provided with in-depth training to ensure they understood the questionnaires to eliminate unnecessary data collection and annotation errors. Various types of data were collected including the characteristics of the business, its owner/proprietor, and food products sold, the different effects of the pandemic on the businesses, and food safety. For some sections of the questionnaire (e.g. price changes) recall data was collected to capture differences in commodity prices before COVID-19, during the lockdown period (April–August, 2020) and in the post-lockdown period (December, 2020). All respondents gave their informed consent to participating in the survey prior to start of the study.

3. Results and discussion

In this section, we present the results of the vendors' survey conducted in urban slum and non-slum locations of Nairobi, Kenya. The results are presented for the pooled sample and sub-samples of vendors disaggregated by slum and non-slum areas.

3.1. Characteristics of food outlets and the business owners in the study areas

Table 1 shows the type of food outlets surveyed, their locality and whether they are in slum or non-slum sites. The number of outlets interviewed by type is a reflection of the distribution of those types of outlets in the study locations. The majority of the outlets in the study sample present in both slum and non-slum locations are the informal tabletop vendors or *mama mbogas* (40%); kiosks are the second most-popular business outlet (20%) across the four locations, followed by mom and pop shops (11%) and butchers (10%). Grocery stores, open-air markets (both wholesalers and retailers) and supermarkets all made up less than 8% of the survey respondents, with supermarkets being the least numerous (3%).

Our survey results are in line with those of Chege et al. (2021) and Wanyama et al. (2019) who found that most households in Nairobi's urban slum areas purchase their food commodities from informal vendors and that, overall, there are very few formal outlets like supermarkets and grocery stores across the urban slums.

Table 1. Sample distribution by location and business type

Types of food outlets		Non-slum		Slum		Overall
	Typology [a]	Dagoretti (n=231)	Donholm (n=231)	Kibera (n=311)	Mathare (n=232)	(n=1005)
Supermarket	Formal	4.76	4.33	2.89	1.72	3.38
Grocery stores	Formal	5.63	5.19	6.43	12.5	7.36
Mom and pop shop	Informal	11.26	12.55	11.58	10.34	11.44
Tabletop/*Mama mbogas*	Informal	39.39	36.36	38.26	45.26	39.7
Kiosk	Informal	19.91	20.35	19.94	20.26	20.1
Butchers	Informal	9.96	10.82	10.61	9.91	10.35
Open-air market (wholesalers)	Informal	4.76	5.19	5.14	0	3.88
Open-air market (retailers)	Informal	4.33	5.19	5.14	0	3.78

[a] *Source: adapted from Chege et al. (2021) and updated/revised based on our field observations.*

We further analyzed the study sample outlets' characteristics, as presented in Table 2. Overall, 97% of all the businesses in the study sample are owned by individual vendors. All the business types surveyed have been operating for more than five years, with slum businesses operating for slightly longer than those in the non-slum areas. This could be because of higher levels of poverty and less financial resources among the slum people, which may not give them the flexibility of changing businesses or even relocating from slum locations, which is indicated by the very low (4%) annual migration rates (Falkingham et al., 2012). About three-quarters of all the sampled businesses allow food purchase on credit.

Table 2. Characteristics of enterprises in the study sample, by slum and non-slum and overall

	Non-slum (n=462)	Slum (n=543)	Overall (n=1,005)
Business classification by ownership type (%)			
Sole ownership	96.75	97.97	97.41
Partnership	3.03	2.03	2.49
Company	0.22	0	0.1
Number of years in business			
Supermarket/ Grocery store	6.5	7.5	7.0
Mom and Pop shop	5.9	7.1	6.5
Tabletop vendors/*Mama mboga*	4.5	6.6***	5.7
Kiosk	5.1	5.9	5.6
Butchery	8.3	9.1	8.7
Open-air market (wholesaler)	6.5	11.4**	8.5
Open-air market (retailer)	7.8	10.5	8.95
Business allowing food purchase on credit (dummy variable)			
Yes	75.11	74.59	74.83

*Notes: n, sample size; *** p<0.01, ** p<0.05*

In addition to understanding the business types, an important element of the study is documenting the characteristics of the business owners who participated in the study (Table 3). The majority of vendors both in slums and non-slum areas are female (61%) and the percentage of female vendors is significantly higher in the slums (67%) compared to non-slum areas (54%). Overall, the highest percentage of vendors across the sites are middle-aged (35–54 years), although slum vendors are older than those in the non-slum areas. Slums have a significantly higher number of older vendors aged between 35−54 years (54%) compared to non-slum areas (42%). There are more youth vendors (25−34 years) in non-slum locations (44%) compared to those in the slums (34%) and the difference is statistically significant.

Table 3. Characteristics of business owners in slum and non-slum areas and overall

	Non-slum (n=462)	Slum (n=543)	Overall (n=1,005)
Female vendors (dummy variable)	54.55	67.03***	61.29
Age of business owners (%)			
Below 25	7.14	6.81	6.97
25–35	43.94***	34.07	38.61
35–55	41.56	53.78***	48.16
55+	7.36	5.34	6.27

*Notes: n, sample size: *** p<0.01*

3.2. Traded food commodities and their sources

Figure 2 shows the proportions of food vendors who trade in different food groups. Overall, fresh vegetables, dairy products (including all milk and milk products) and eggs are the most traded food groups. However, a significantly higher proportion of vendors in slums trade in fresh vegetables (43%) compared to non-slum vendors (33%). About 23% and 25% of vendors sell fresh fruits in slum and non-slum areas, respectively. A significantly higher proportion of non-slum vendors (28%) sell dairy products compared to their counterparts in the slum area (20%). A higher proportion of non-slum area vendors (16%) trade in roots and tubers compared to those in slum areas (11%). Similarly, a higher proportion of vendors in non-slum areas (22%) trade in cereals compared to vendors in slum areas (19%). Live and slaughtered poultry and rabbit are the least traded animal source foods (less than 1%) across the study sites. Survey results show a comparatively higher demand for vegetables, fruits, and eggs and a lower demand for dairy products, nuts and pulses, fish, cereals, and tubers in slum areas compared to non-slum areas, which could be attributed to their affordability.

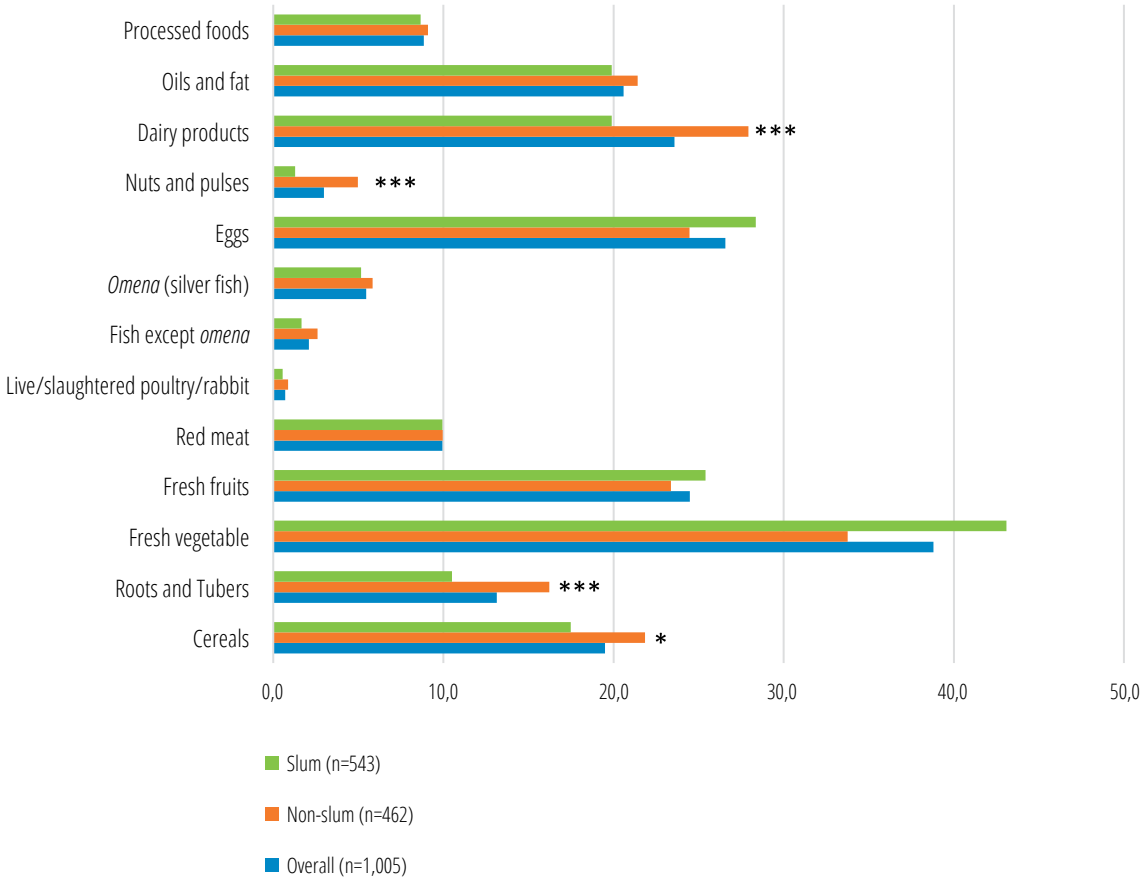

Figure 2. Percentage of foods by food category traded by slum and non-slum vendors in Nairobi, Kenya
Note: Dairy products category includes all milk and milk products; processed foods include all value-added products.

In Table 4, we present the most frequently sold commodities per food group. Bananas, mangoes, and avocadoes are the three most-traded fruits in both slum and non-slum areas. The most popular fruits in non-slum locations are mangoes (sold by 31% of vendors) followed by bananas (26%), while in the slum areas it is the reverse, with bananas (41%) as the most-sold fruit, followed by mangoes (29%). The popularity of bananas over other fruits in slum areas could be because they are cheaper. During the study period, mangoes were in season and therefore in abundant supply. Pawpaw is the least sold fruit among vendors across the study sites. Overall, tomatoes and onions are almost equally the most traded vegetables, sold by just over 23% of the vegetable vendors. More vendors in slum areas sell leafy vegetables (kales, spinach, and indigenous vegetables) compared to vendors in non-slum areas, while the other vegetables (cabbages, tomatoes, and onions) are sold more in non-slum areas.

Beans are sold by nearly all of the surveyed legume and pulse vendors. Processed cereals (flours) are sold more than unprocessed cereals (such as maize grain). Sifted maize flour (packed maize flour) is the most traded cereal across the study sites (38%), followed by rice (33%), then wheat flour (22%). The trend is similar even when differentiating between slum and non-slum locations.

Among fish and animal products category, eggs are the most sold products (39%) probably because eggs are one of the most affordable animal proteins, followed by milk and dairy products (34%). In the non-slum areas, milk is the most traded animal product (38%), followed by eggs (34%). Chicken is the least traded animal product across all sites, probably due to its price. In Nairobi (including the four study sites), chicken is generally more expensive than other animal-source proteins such as beef, pork, and fish (Cornelsen et al., 2016). Irish potatoes are the most traded roots and tubers, sold by more than 84% of the vendors across all survey sites.

Table 4. Percentage of vendors who traded various foods in each food group

Food groups	Commodity	N	Non-slum	Slum	Overall
Fresh fruits	Watermelon	34	9.69	4.63	7.00
	Oranges	30	7.49	5.02	6.17
	Lemons	26	3.52	6.95	5.35
	Pawpaw	16	4.85	1.93	3.29
	Avocadoes	70	17.18	11.97	14.4
	Mangoes	144	30.84	28.57	29.63
	Banana	166	26.43	40.93	34.16
Vegetables	Kales	167	13.74	16.64	15.51
	Spinach	132	11.37	12.82	12.26
	Indigenous vegetables	84	7.35	8.09	7.80
	Cabbage	143	15.17	12.06	13.28
	Tomatoes	251	24.88	22.29	23.31
	Onions	244	23.93	21.83	22.66
	Carrots	56	3.55	6.26	5.2
Legumes and pulses	Beans	34	52.94	69.44	64.15
	Peas	10	23.53	16.67	18.87
	Lentils	9	23.53	13.89	16.98
Cereals	Maize grain	23	4.04	7.11	5.62
	Maize flour (sifted[a])	162	41.92	37.44	39.61
	Rice	133	29.8	35.07	32.52
	Wheat flour	91	24.24	20.38	22.25
Fish and animal products	Beef	88	10.24	12.82	11.56
	Pork	8	1.35	0.77	1.05
	Goat/Mutton	19	3.5	1.54	2.50
	Chicken (broiler)	8	1.08	1.03	1.05
	Omena (silver fish)	55	7.82	6.67	7.23
	Other fish	26	4.04	2.82	3.42
	Milk and dairy products	215	37.74	30.77	34.17
	Eggs	297	34.23	43.59	39.03
Roots and tubers	Irish potato	108	82.61	85	83.72
	Sweet potato	14	11.59	10	10.85
	Arrowroot	7	5.8	5	5.43
Sugars and oils	Oil	189	41.63	46.36	44.06
	Fat	23	7.66	3.18	5.36
	Sugar	217	50.72	50.45	50.58

Notes: [a] Sifted maize flour is the milled, refined and packed maize flour

To understand whether COVID-19 has affected how vendors source their sale produce, the survey also included questions on the current sources of different food commodities. Figure 3 presents these findings. Fruits and vegetables are mainly sourced from open-air markets in estates outside those where the study vendors are located. The slum area vendors source their legumes, pulses, and unprocessed cereals, such as maize grain, mostly from wholesalers located in other estates, whereas the vendors in non-slum areas rely on a diversity of suppliers: from farmers in other counties, to wholesalers and open-air markets in other estates. Processed cereals, mainly maize and wheat flour, and rice, are mostly obtained from wholesalers within the estate for all study site vendors. Fish was mainly sourced from fisherfolk in other counties by both slum (49%) and non-slum vendors (39%), but open-air markets are also an important source of fish for non-slum vendors. More than 65% of milk, dairy products and eggs were sourced from wholesalers within the estates in slum and non-slum areas.

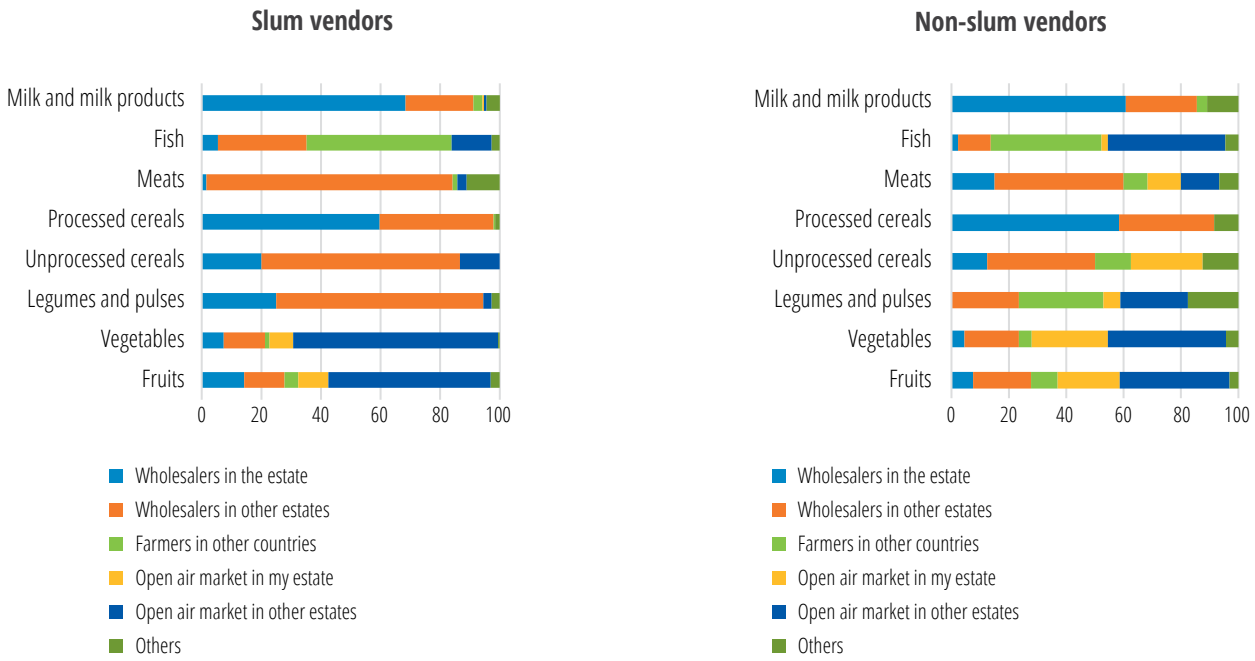

Figure 3. Current sources of food commodities sold by vendors in slum and non-slum locations

Note: Other sources include other retailers within the estate, farmers within Nairobi, other countries, companies, own farm and slaughterhouse (for meats); meats include beef, chicken, pork and goat/mutton.

The vendors were further asked whether the location from which they source their produce changed in 2020 compared to where they sourced before the COVID-19 pandemic. About 70% of the vendors reported no change in their sourcing location (Table 5). Among those who reported a change, 17% and 6% of vendors in slum and non-slum areas, respectively, attributed changing the sourcing location to government-imposed COVID-19 restriction of movement. Additionally, vendors in slum (16%) and non-slum (13%) areas reported that they changed sourcing location because they could obtain the commodities from closer by, while 9% indicated that commodities became cheaper in other locations.

Table 5. Vendors' reasons for changing the sourcing location of their commodities

Reasons	Non-slum (n=462)	Slum (n=543)	Overall (n=1,005)
Sourcing location did not change	70.50%	68.79%	69.59%
Able to obtain food commodities from a closer location	12.95%	15.92%	14.53%
Food commodities became cheaper in another location	10.79%	7.64%	9.12%
Movement restrictions due to COVID-19	5.76%	16.56%***	11.49%
Stopped dealing in the food commodities sourced from that location	4.32%**	0.64%	2.36%

*Note: n, sample size: ** p<0.05, *** p<0.01*

3.3. Food safety

Urban vendors trade in fresh food products that are prone to contamination and other food safety challenges. Previous studies in the slums of Nairobi have reported various food safety issues within the food environments (Karanja et al., 2010; Kutto et al., 2011). In addition, the COVID-19 virus can be transmitted from one person to another through poor food handling. Therefore, identifying whether vendors are aware of food safety and how, if at all, they address food safety challenges in their businesses is important.

Vendors were asked whether they are concerned about food safety in their businesses, what food safety concerns they have and whether they take any actions to strengthen food safety in their businesses. The majority of slum vendors (91%) and non-slum vendors (89%) were concerned about food safety related to their business (Figure 4). The few vendors (about 10%) who reported no concerns in food safety indicated that they either do not sell perishable commodities or they have never experienced any food-safety concerns related to their business.

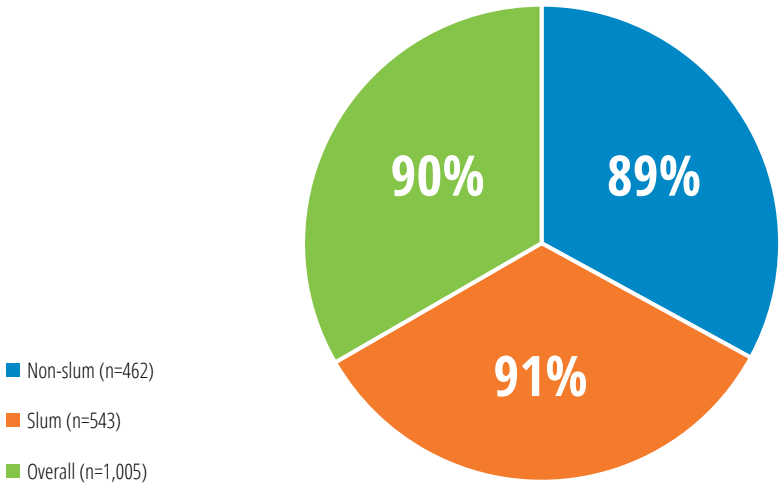

Figure 4. Percentage of vendors who are concerned about food safety related to their business

Vendors who indicated that they are interested in or concerned about food safety from a business perspective (Figure 4), were asked follow-up questions on the reasons for their concerns. Their most reported concern is driven by consumer demand for safe foods. This concern was reported by a significantly higher percentage of non-slum vendors (91%) than slum vendors (83%) (Table 6). Vendors assure their customers that their products are safe but there is no means of verification. The second most important reason for vendors' concerns over food safety is due to customers' increased awareness about food safety, as mentioned by a significantly higher proportion of non-slum vendors (65%) compared to slum vendors (34%). Finally, the third reason mentioned by a significantly higher percent of non-slum vendors (32%) compared to slum vendors (21%) is that it is a Ministry of Health requirement to observe food safety rules and regulations. Only 1% of vendors across all sites indicated food contamination and food poisoning as a food safety concern.

Table 6. Reasons for vendors' interest in food safety related to their businesses

Reasons	Non-slum (n=413)	Slum (n=498)	Overall (n=911)
Customers' increased awareness about food safety	64.6%***	33.9%	47.9%
Customers are keen to purchase safe foods	90.8%***	82.5%	86.3%
It is a Ministry of Health requirement	31.5%***	20.5%	25.5%
Avoid food contamination and food poisoning	0.5%	1.6%	1.1%

*Notes: n, sample size: *** p<0.01*

More than 95% of the vendors surveyed indicated that they take action to ensure food safety in their businesses; however, a higher proportion of non-slum vendors (100%) report taking action compared to their slum vendor counterparts (95%) (Table 7). Food safety actions taken by both slum and non-slum vendors are presented in Figure 5.

Table 7. Proportion of vendors who take action to ensure food safety

Ensuring food safety	Non-slum (n=413)	Slum (n=498)	Overall (n=911)
No	0.24%	4.82%***	2.74%
Yes	99.76%***	95.18%	97.26%

*Notes: n, sample size: *** p<0.01*

The most common food safety action mentioned by all vendors is storing food commodities in 'hygienic conditions'. This was reported by a significantly higher percentage of vendors in the non-slum locations (87%) compared to those located in the slums (76%) (Figure 5). However, it would be important to follow up on this question to understand what the vendors define as 'hygienic conditions'. The second most-mentioned food safety action is disposal of commodities that have expired or have gone bad, which was mentioned by a significantly higher percentage of non-slum (45%) than slum (36%) vendors. It would also be important to explore this further, given that most fresh produce does not have a 'sell by' date and therefore expiry is subjective and determined by the vendors themselves. The third most-mentioned food safety action is washing the commodities, as indicated by a significantly higher percentage of slum vendors (42%) than non-slum vendors (35%). A question that remains unanswered is the quality of the water used to wash these commodities. A significantly higher percentage of non-slum vendors indicated that they source their commodities from pre-qualified suppliers (49%) compared to the slum vendors (11%). Pre-qualified suppliers refers to the suppliers who they know and whose products they trust, for example in the case of fresh leafy vegetables, they ascertain that the suppliers do not irrigate them using sewage water. However, the vendors do not conduct frequent visits to the production sites (farms) to verify whether their suppliers' indications about the growing conditions are true. Lastly, 6% of all the vendors surveyed indicated that they train their staff in food safety.

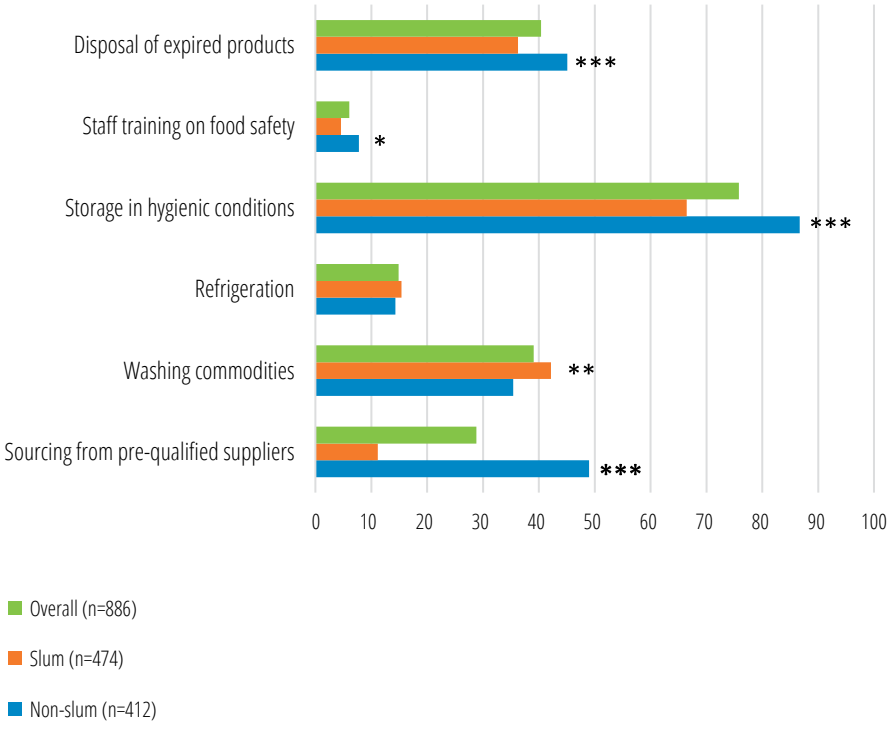

Figure 5. Actions taken by slum and non-slum vendors to ensure food safety for traded foods

3.4. COVID-19 awareness and its effects on business

In this section, we report on vendors' awareness about COVID-19, their sources of information, the effects of the pandemic on their food businesses and their coping strategies. Almost all slum and non-slum vendors are aware of COVID-19 (Table 8). The most important source of COVID-19 related information is mass media (radio/television) for vendors across all sites (Figure 6). In addition, a significantly higher proportion of non-slum vendors receive information from social media (59%) and family members (33%) compared to slum vendors (24% and 20%, respectively). Community members and NGOs were identified as important sources of information for slum vendors compared to the non-slum vendors. This shows that, other than mass media, the slum vendors rely on their community social networks to obtain information about COVID-19.

Table 8. Vendors' awareness about COVID-19 across the study sites

Awareness	Non-slum (n=462)	Slum (n=543)	Overall (n=1,005)
No (%)	0.22	0.37	0.3
Yes (%)	99.78	99.63	99.7

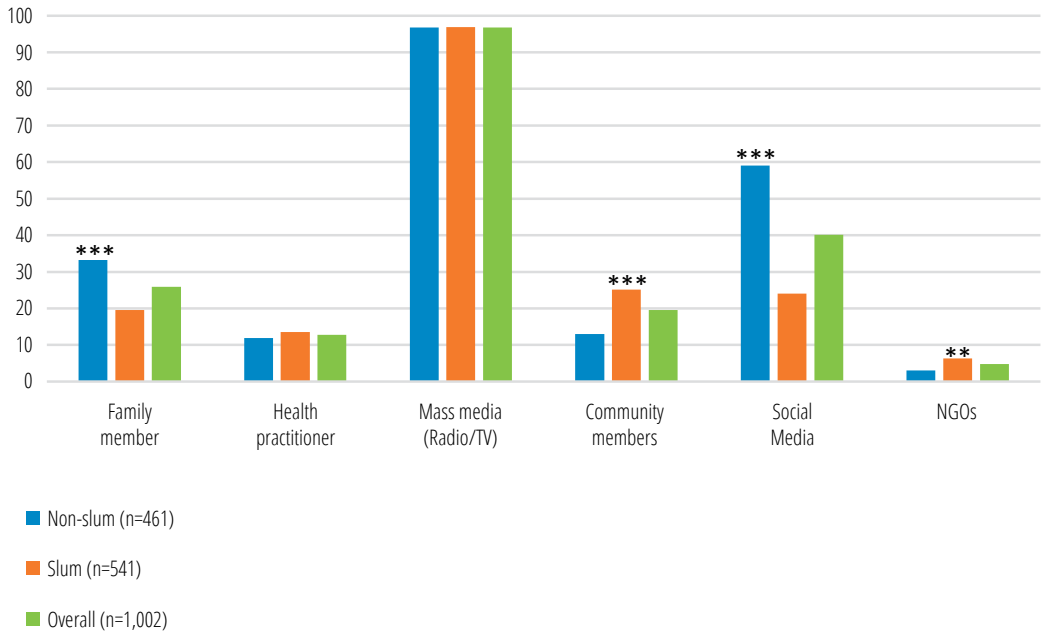

Figure 6. Sources of information on COVID-19 by slum and non-slum vendors

Almost all vendors are aware of the characteristics of COVID-19 and how infection can be prevented (Table 9). However, a small percentage of vendors (5%) still believe that the disease if for the urban people, the elderly, and non-Africans, and this is mostly in the non-slum areas (9%) compared to the slum areas (2%). Another 3% of the respondents believe that COVID-19 does not exist.

Table 9. Information known by slum and non-slum vendors about COVID-19

Information	Non-slum (n=461)	Slum (n=541)	Overall (n=1,002)
It's a high-fever disease	42.52***	28.84	35.13
Involves coughing, high fever and difficulty in breathing	66.38	67.84	67.17
It's highly infectious	31.02	43.99***	38.02
It's a myth	2.39	2.59	2.50
It can be prevented by washing hands, sanitizing products and surfaces, wearing masks, and social distancing	65.29***	56.75	60.68
It's a disease from China	20.39***	12.57	16.17
It's a killer disease	43.38	47.50	45.61
It's a disease for the urban people, the elderly and non-Africans	8.89***	2.03	5.19
It has no cure	0.43	0.92	0.70
It's a story from government. No disease	0.00	1.29**	0.70
It's a normal flu	0.43	0.92	0.70
COVID-19 is curable	1.08*	0.18	0.60

*Note: n, sample size: * P < 0.1, ** P < 0.5, *** P < 0.01*

In terms of how the pandemic has affected formal and informal businesses across the study sites, our analysis shows that almost all of the sampled food businesses have been affected by COVID-19 (Figure 7). However, a higher proportion of businesses in slums (99.6%) have been affected compared to those in non-slum areas (95%).

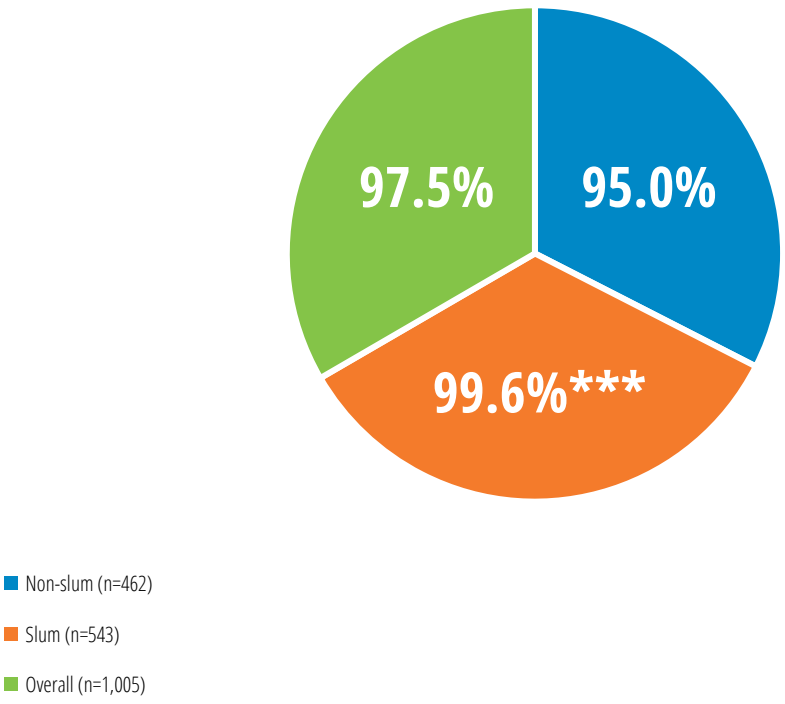

Figure 7. Proportion of food businesses across the study sites affected by COVID-19

The COVID-19 pandemic has affected businesses in diverse ways and, with some effects differing across study sites (Table 10). The highest percentage of vendors (93%) indicated that they experienced lower sales or fewer customers due to the pandemic. A significantly higher number of slum vendors (98%) compared to non-slum vendors (88%) mentioned this impact. The second major effect was on food prices. Overall, 34% of all the vendors mentioned increases in food prices due to COVID-19, but a significantly higher number of non-slum vendors (41%) reported price increases compared to slum vendors (29%). Other vendors mentioned challenges in terms of access to food supplies for their business (14%) and default by customers purchasing on credit (13%), all of which were linked to COVID-19.

Table 10. COVID-19 pandemic effects on food businesses in slum and non-slum locations

How business has been affected	Non-slum (n=462)	Slum (n=543)	Overall (n=1,005)
Difficulty accessing food supplies for my business	14.1	14.6	14.4
Lower sales/fewer customers	87.5	97.8***	93.2
Increased prices for the food products I sell	40.8***	28.5	34.0
Quality of food commodities from suppliers declined	3.6	2.4	3.0
Defaulting of credit by buyers	11.4	13.5	12.6
Difficulty importing food commodities from other countries	1.1	0.6	0.8
Could not pay back business loans I had taken	1.4	1.3	1.3

*Note: n, sample size *** P < 0.01*

Since the start of the COVID-19 pandemic, the Government of Kenya has been progressively implementing measures to reduce the spread of the virus. The vendors surveyed were asked whether any of the government measures had affected their businesses (Figure 8). The majority of vendors (82%) reported that curfews negatively affected their businesses, particularly slum businesses (89%) compared to the non-slum businesses (73%) and the difference is statistically significant. During the period when curfews were in place, activities and movements were restricted between 10pm and 4am, which were adjusted to 7pm and 5am during the lockdown period. This meant that businesses had to close earlier to allow employees to arrive home before curfew time.

During the lockdown period, the government identified four counties (Nairobi, Mombasa, Kilifi and Kwale) as 'hotspots' for COVID-19- counties with higher number of infections reported, and restricted movement into and outside those counties. In our study, about 27% of businesses in both slum and non-slum areas reported to have been affected by the lockdowns.

Other measures such as restricted movement within the country area, increased sanitary measures, wearing masks and advice to citizens to avoid gatherings affected less than 10 % of the businesses, but a higher proportion of non-slum businesses were affected by these measures compared to the slum businesses. Closure of open-air markets and advice to citizens to stay home affected less than 10% but the effects were greater in slum areas compared to non-slum areas.

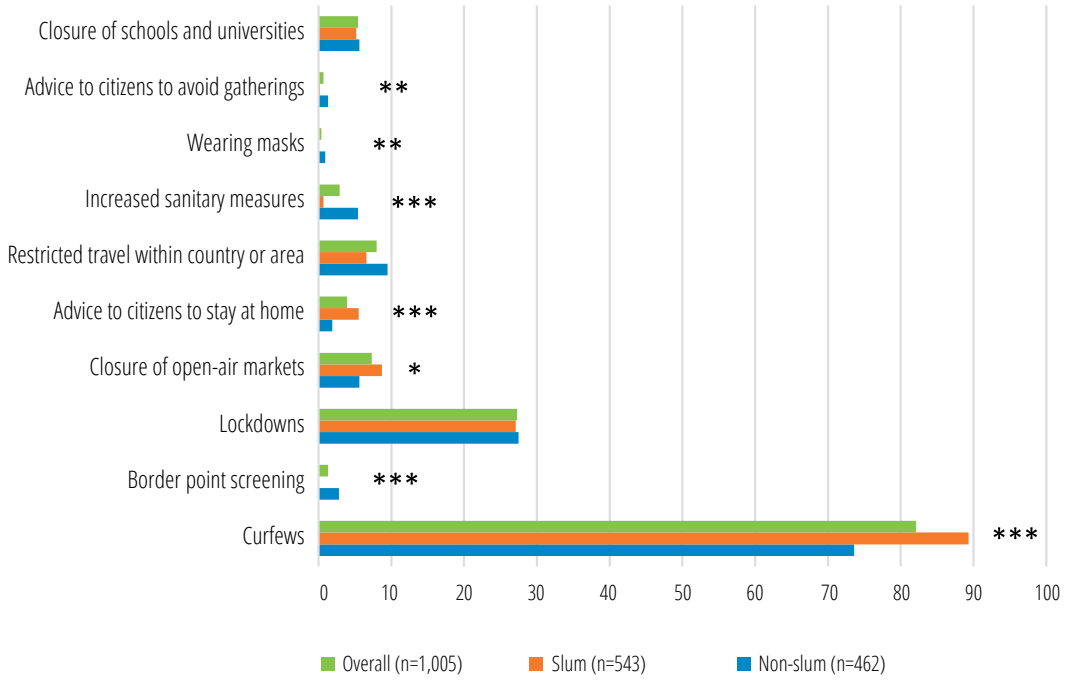

Figure 8. Effects of COVID-19 containment measures on businesses surveyed in the four study sites

Vendors surveyed were asked what strategies they adopted to minimize the effects of government containment measures on their businesses (Table 11). Only 5% of them reported not having a strategy. Across all sites, most of the vendors reduced their purchases from suppliers (74%); this coping strategy was reported by a higher percentage of vendors in the slums (77%) than by non-slum vendors (71%). Vendors also reduced sale on credit (32%) to avoid default payments by customers. This strategy was significantly higher for vendors in the slums (42%) compared to the non-slum vendors (19%). The second most popular coping strategy among non-slum vendors (26%) was diversifying their products, with a statistically significant difference compared to only 6% of vendors adopting this strategy in the slums. Other less-statistically significant coping strategies used mostly by slum vendors include laying off staff, walking to work, changing business typology and reducing employee pay, while a higher percentage of non-slum vendors resorted to opening their businesses earlier to extend their business hours, possibly to compensate for curfew times.

Table 11. Vendors' coping strategies to minimize the effects of government measures on businesses

Coping strategy	Non-slum (n=462)	Slum (n=543)	Overall (n=1,005)
No action taken	8.4	2.8	5.3
Diversify products	25.8***	5.9	14.6
Reduce purchases	70.9	76.5**	74.1
Reduce sale on credit	18.7	42.4***	32.1
Laid off staff	3.1	4.6	4.0
Walking to work	0.5	5.6***	3.4
Change of business	0.8	1.2	1.0
Changed sourcing place	0.5	0.3	0.4
Increased selling price	0.2	0.5	0.4
Offered delivery services	0.7	0.5	0.6
Opening the business earlier than before	2.8**	1.4	2.0
Reduced employee's pay	0.0	0.8**	0.4

*Note: n, sample size: * P < 0.1, ** P < 0.5, *** P < 0.01*

3.5. Food price trends pre-COVID-19, during lockdown, and post-lockdown

As indicated in Table 10, an increase in commodity prices was highlighted as one of the ways in which the pandemic has affected food businesses. Vendors were asked questions on prices of selected commodities at the time of the survey (December 2020) which was post-lockdown period, and then they were asked to recall the prices of the same commodities in April/May 2020 (during the first lockdown period[2]) and the period before COVID-19 (Jan/Feb 2020). Commodities selected were the commonly traded commodities overall. Figures presented in this section show price changes during the three-time period.

Figure 9 shows average purchase price paid by vendors per kilogram for fresh fruits to be sold in slum and non-slum areas. Slum area vendors buy mangoes and avocadoes at a higher price compared to non-slum vendors, while the non-slum vendors buy bananas at higher prices compared to the slum vendors. The source price paid for mango, watermelon, and avocado by vendors (both slum and non-slum) increased between the pre-COVID period and during lockdown periods, and then decreased between lockdown and post-lockdown periods. However, post-lockdown fruit prices are slightly higher than for the pre-COVID period for most of the studied fruits, except for bananas in the slums. The price increase in the slums is higher than in the non-slum areas. Mangoes are usually in season from December to April and the other fruits of study are in season throughout the year. Therefore, we expect minimal seasonal effects for these four fruits during the study period.

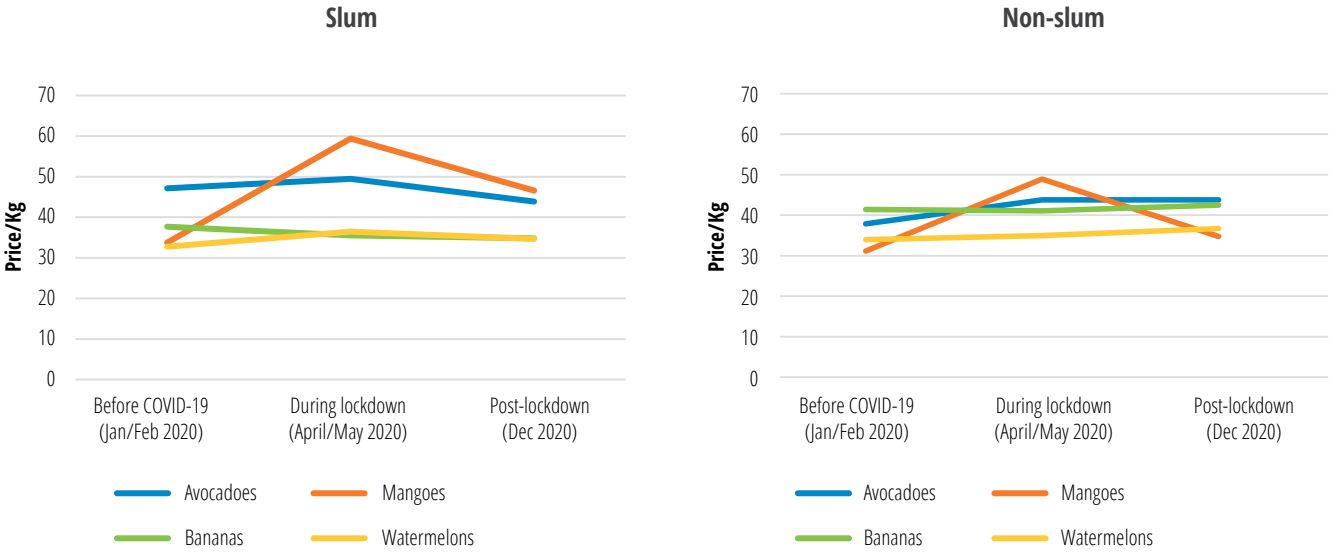

Figure 9. Average vendors' buying prices (in KES) per kilogram for selected fruits in slum and non-slum areas

Figure 10 shows average price paid by consumers per kilogram of the four study fruits (avocado, mango, banana, and watermelon). In slum areas, consumer prices for mango and avocado increased slightly between the pre-COVID-19 and the lockdown period, and then increased more sharply between lockdown and post-lockdown periods. Banana prices in the slums increased slightly while watermelon prices decreased slightly throughout the three periods. In non-slum areas, consumer prices for avocado increased steadily throughout the three periods, while mango and banana prices increased between pre-COVID-19 and lockdown period and then decreased between lockdown and post-lockdown periods. Consumer prices for watermelon decreased between the pre-COVID and lockdown period, and increased between lockdown and post-lockdown periods. The findings show that price increases for fruits are higher in the slums than in non-slum areas.

2 The first lockdown in Nairobi, Kenya, was from April to August 2020 but the price recall was asked for the April/May period which fell within the lockdown period.

Figure 10. Average consumer prices (in KES) per kg for selected fruits in slums and non-slum areas

Figure 11 shows the average price paid by vendors per kilogram for seven vegetables (cabbage, carrots, indigenous vegetables, kales, onions, spinach, and tomatoes), selected for this study, and destined to be sold in the Nairobi slums and non-slum areas. Vendors' purchase prices are generally lower in non-slum areas compared to slum areas, where price fluctuations across the three periods are greater, showing steeper trends for slum vendors. The price of kales, tomatoes, onions, indigenous vegetables, and cabbage increased between pre-COVID-19 and lockdown periods, and then decreased during the post-lockdown period in both slum and non-slum areas. Prices for carrots and spinach in slum areas increased steadily throughout the three periods, while prices in non-slum areas increased between pre-COVID-19 and lockdown periods, and then decreased during the post-lockdown period. It is clear that vendor buying prices for most of the vegetables increased during the lockdowns.

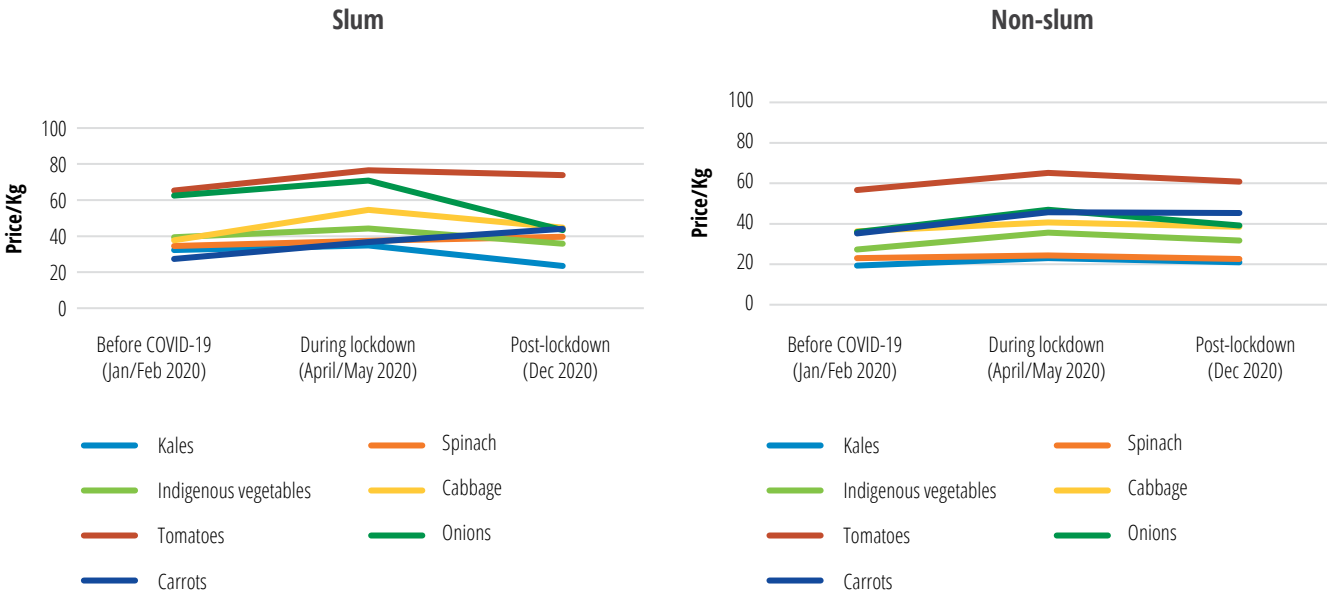

Figure 11. Average purchase price (in KES) paid by vendors per kilogram for selected vegetables in slums and non-slum areas

Figure 12 shows the average consumer purchase prices per kilogram for the seven selected vegetables in slums and non-slum areas. Similar to vendors' purchase prices, consumers in the slums paid higher prices for these vegetables than consumers in non-slum areas. In non-slum areas, consumer purchase prices for the selected vegetables increased between pre-COVID-19 and lockdown periods and then decreased during the post-lockdown period. The trends are similar in the slums, differing slightly only for two of the seven selected vegetables. With the exception of tomatoes and kales whose prices continued to increase steadily throughout the three periods, prices for the other five vegetables were highest across the study sites during the lockdown period compared to the other two study periods. The prices of kales and tomatoes may have been affected by seasonality. December is a rainy season in the Eastern part of the country that feeds Nairobi with the two commodities, and kales and tomatoes are highly affected by rains. Therefore, heavy rains in December may have affected supply of the two commodities therefore making prices to go up.

There is a sharp decrease in the onions prices between lockdown and post-lockdown periods (Figures 11 and 12). This may have been the effect of cross-border trade restrictions, a government measure put in place during the lock down period. A high amount of onion consumed in Kenya comes from the neighboring countries, especially Tanzania (FAO, 2014. Restricted cross-border trade would limit the supply of onions and therefore lead to an increase in prices.

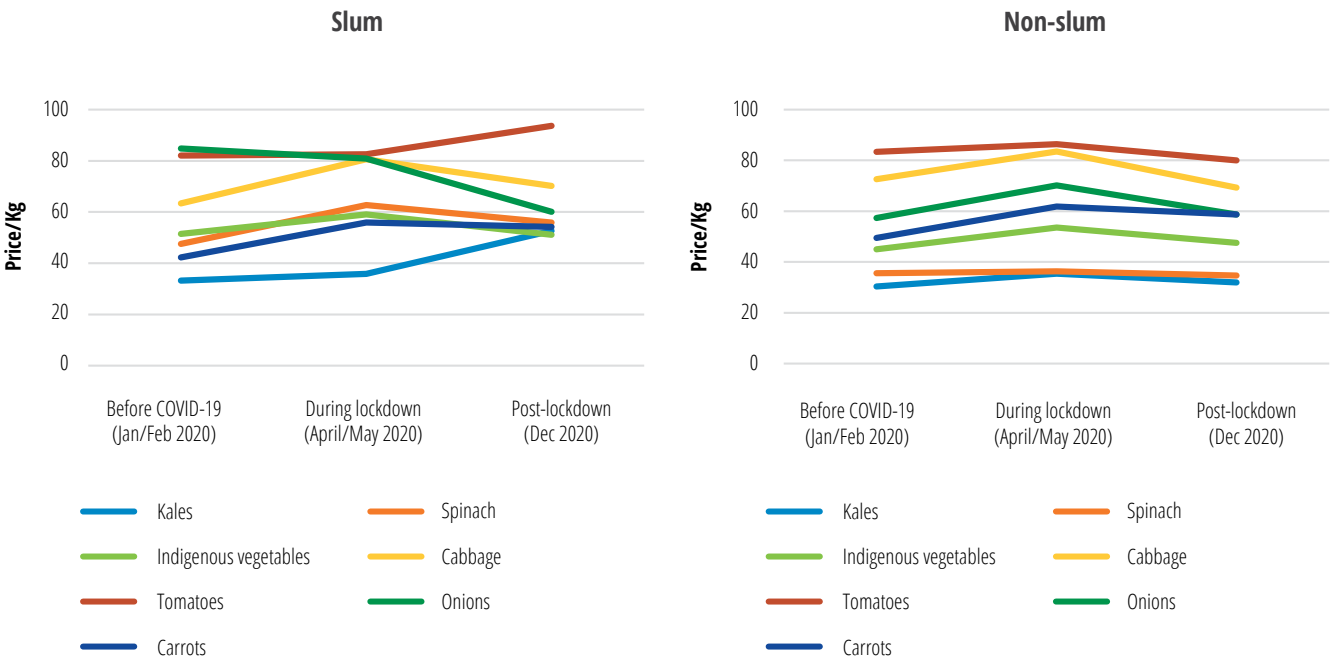

Figure 12. Average consumer prices (in KES) per kilogram for selected vegetables in slums and non-slum areas

Figure 13 shows the average vendor purchase price per kilogram of cereals in slums and non-slum areas. The most traded cereals were maize flour (both packed), wheat flour, and rice. Cereal prices in slums and non-slum areas are not very different. The figures show that rice and wheat flour prices increased throughout the three periods in both slum and non-slum areas. For wheat flour, the increase between lockdown and post-lockdown periods is steeper than the increase between pre-COVID-19 and lockdown periods. Prices of maize flour slightly increased between pre-COVID-19 and lockdown periods and then start to decline slightly. The trends are similar for the consumer purchase prices for cereals in both slum and non-slum areas as shown in Figure 14.

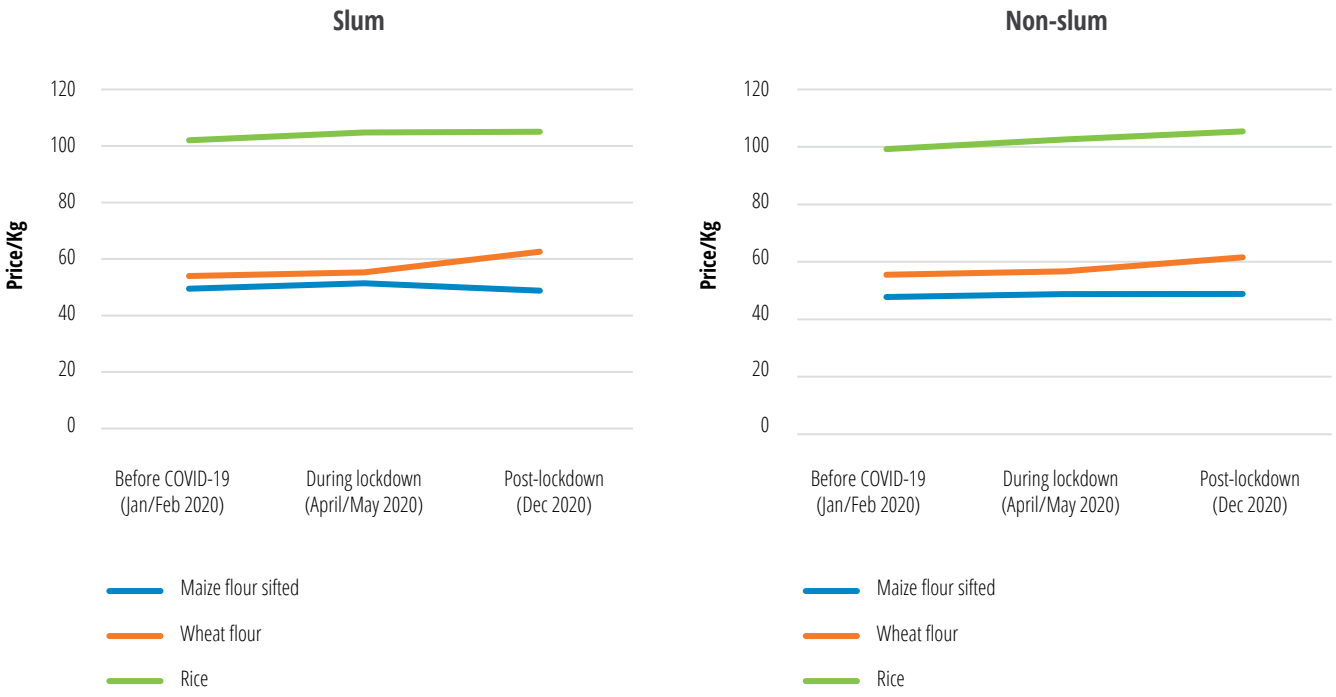

Figure 13. Average vendor buying price (in KES) per kilogram of selected cereals in slums and non-slum areas

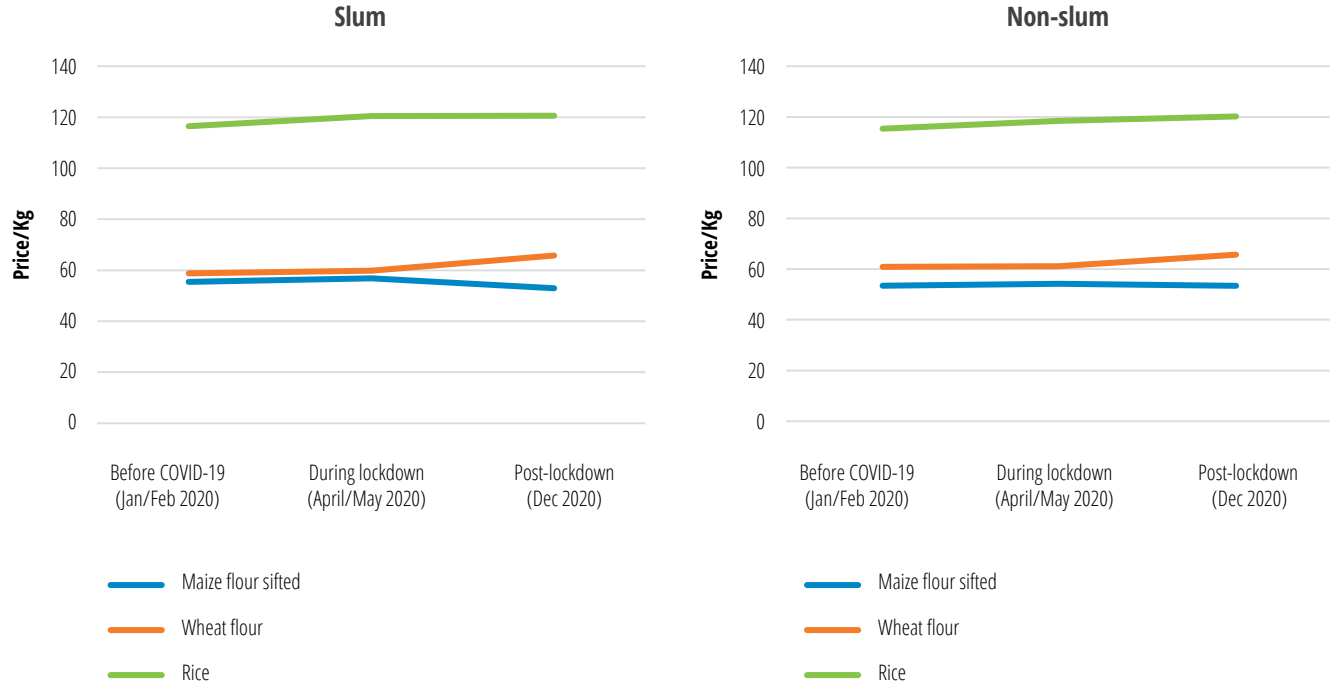

Figure 14. Average consumer prices (in KES) per kilogram for selected cereals in slums and non-slum areas

Figures 15 and 16 show the average vendor and consumer purchase prices, respectively, per kilogram of beans in slums and non-slum areas. Across all study sites, vendors' purchase prices for beans increased steadily from the pre-COVID-19 period through to the post lockdown period (Figure 15). However, the rate of price increase in non-slum areas for vendors between the 2020-lockdown and post lockdown period was comparatively slower than in the pre-lockdown period. The consumer prices for beans slightly increased between pre-COVID-19 and lockdown periods, then stabilized in the post-lock down period, for both slum and non-slum areas (Figure 16).

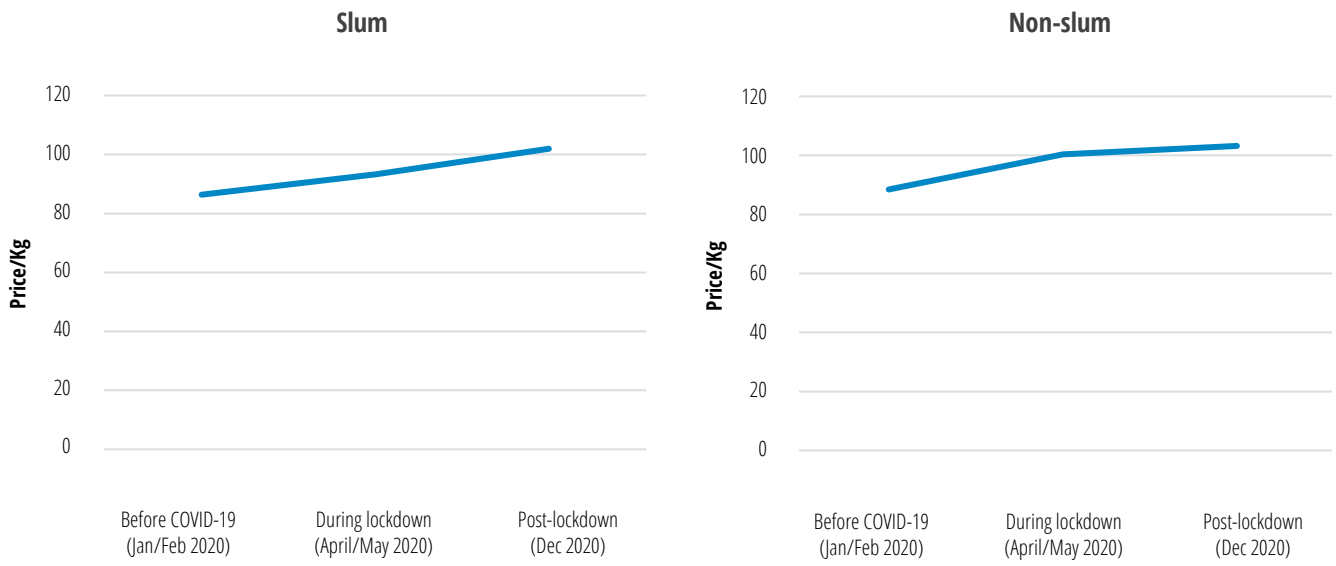

Figure 15. Average vendor purchase price (in KES) per kilogram of common beans in slums and non-slum areas

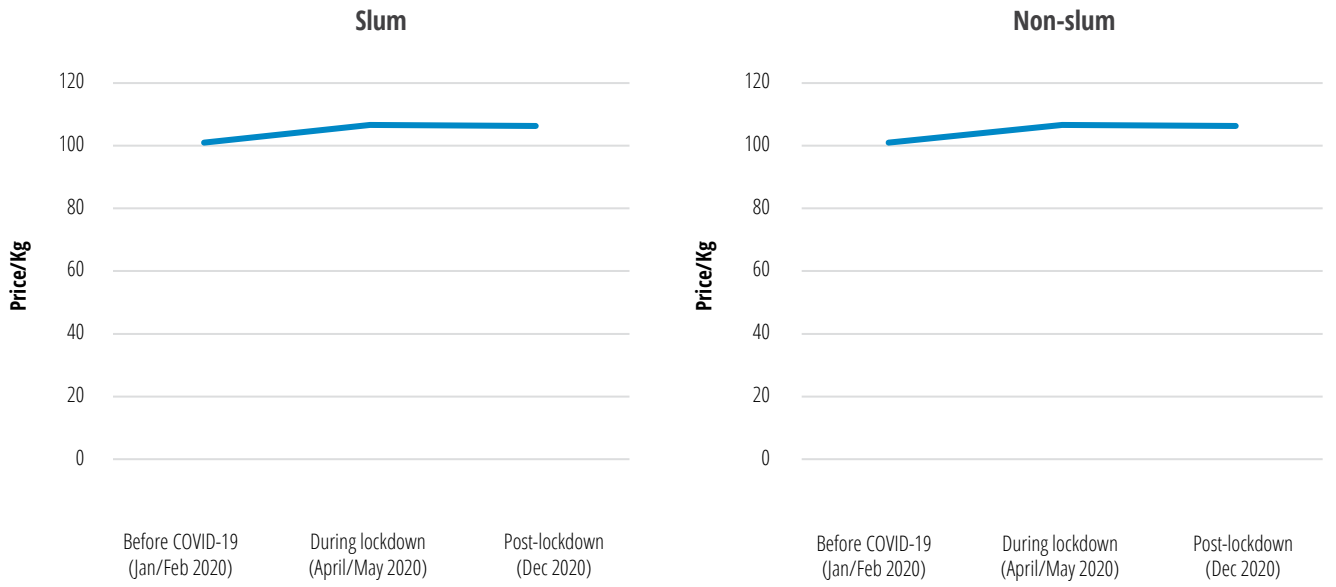

Figure 16. Average consumer price (in KES) per kilogram of common beans in slums and non-slum areas

Figures 17 and 18 present the vendors' and consumers' purchase prices, respectively, for selected animal source foods. Vendors' purchase prices for beef, eggs, and milk increased between pre-COVID-19 and lockdown periods, as well as between lockdown and post-lockdown periods, in both slum and non-slum areas (Figure 17). Eggs recorded a marginal price increase in the three periods in both slum and non-slum areas, while milk prices remained stable in both areas despite the lockdown. Prices for *omena* (silver fish) increased during lockdown and then decreased in the post-lockdown period in slum and non-slum areas. Prices for *omena* were slightly higher in non-slum areas than in the slum areas. This could be because of the high demand for that type of fish in the slums and because it is more affordable than other types of fish.

Figure 17. Average vendor purchase price (in KES) per kilogram of *omena* (silver fish) and selected animal products in slums and non-slum areas

In terms of vendors' sales prices (consumer buying prices), beef increased during lockdown and post-lockdown periods in both slum and non-slum areas. Prices for *omena* (silver fish) increased during lockdown and then decreased post-lockdown in slum and non-slum areas, showing a higher price increment in the non-slum locations compared to the slum locations. Milk prices remained relatively stable throughout the study period both in slum and non-slum areas. Lastly, egg prices increased slightly during lockdown and then decreased during the post-lockdown period in slum areas, while in non-slum areas the prices increased throughout the three periods.

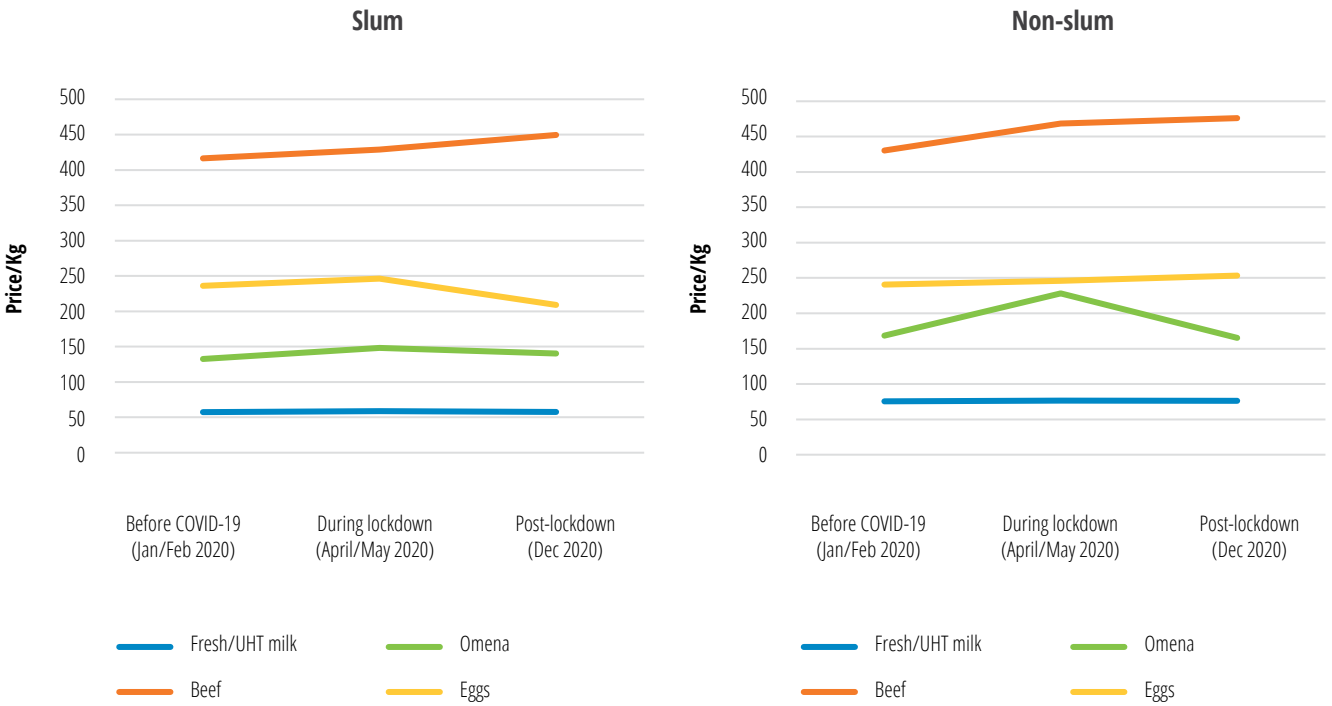

Figure 18. Average consumer price (in KES) per kilogram fish and selected animal products in slums and non-slum area


CIAT/G. Smith

4. Conclusion

In this working paper, we have analyzed the effects of the COVID-19 pandemic on the urban food environment of urban Nairobi, Kenya. The analysis presents the findings of a food vendors' study conducted with formal and informal vendors in urban Nairobi. Study participants are disaggregated by slum and non-slum locations. The analysis highlights the main characteristics of food enterprises and the business owners, foods traded and their sources, food safety, vendors' awareness regarding COVID-19 and the pandemic's effects on food businesses and prices for selected products before COVID-19, during the 2020 lockdown and post-lockdown periods.

The majority of businesses in the study sample are tabletop vendors/*mama mbogas*, followed by kiosks in both slum and non-slum areas. Our findings are similar to those of earlier studies conducted by Chege et al., (2021) and Wanyama et al. (2019) in the same locations before the pandemic. Vendors in the slum areas have been operating for a longer time than those in the non-slum areas. A higher percentage of the food vendors across the slum and non-slum study sites are female (61%), which is the case for most African cities (Proietti et al., 2014). The majority of food vendors in the slum areas are middle-aged (35–54 years), compared to non-slum areas where the majority are younger (25–34 years). This could be explained by the increasing numbers of older persons in the Kenyan slums, where the annual migration rate is only 4% (Falkingham et al., 2012). Additionally, slum households have less income and it may therefore take them longer to accumulate the resources needed to start a business, unlike the households in the non-slum locations. Fresh vegetables, specifically tomatoes and onions, are the most traded foods in both slum and non-slum areas. Bananas and mangoes, beans, and sifted maize flour are the most traded fruits, legume, and cereal, respectively. With regard to animal source products, eggs are the most traded, while Irish potato is the most traded in the roots and tubers category. Most of the foods traded are either sourced from wholesalers or from open-air markets in the estates other than where they are sold.

Most vendors report that they take an interest in food safety because customers often ask about the safety of their products, giving a clear indication that their food safety concerns are demand driven. Interviews with vendors revealed that food safety awareness has increased both among consumers and vendors during the COVID-19 pandemic. Slum and non-slum vendors indicated that they ensure food safety by storing food commodities in what they term as 'hygienic conditions'. Additionally, non-slum vendors source commodities from known/pre-verified suppliers, while the slum vendors tend to wash their products to ensure food safety. However, both the quality of the water used to clean these commodities and the growing conditions of the foods sourced need to be verified. Earlier studies with kiosk vendors in the Nairobi slums showed possible food contamination from insufficient food hygiene practices such as improper storage and poor personal hygiene by food handlers. Lab results revealed that E.coli and coliform were present in both beans and kales at levels that warrant concern (Wandolo, 2011).

Almost all vendors surveyed are made aware of the COVID-19 virus mainly through mass media (radio and TV). Almost all vendors report that COVID-19 had seriously affected their businesses mainly through reduced sales, particularly slum vendors compared to their non-slum counterparts. Vendors also report that government measures aimed at curbing COVID-19 negatively affected their businesses. Curfews, in particular, are the measures that affect most of the businesses, but more so those in the slums than in non-slum areas. Most vendors (95%) indicated that they have adopted some form of coping strategy to counter the effects of COVID-19 on their food businesses; the most popular strategy has been to reduce their stock of products for sale, followed by reducing sale on credit and diversifying their stock. Similar findings amongst consumers in the same slums indicated that curfews and lockdowns had also affected them by reducing their daily wages and monthly household incomes, in turn affecting their spending power and consumption behavior (Chege et al., 2020).

With regard to price fluctuations for selected foods, prices for almost all selected foods increased between the pre-COVID-19 and lock-down periods. Prices for most of the food supplies (mostly fruit and vegetables, *omena* (silver fish), beans, and Irish potatoes) then decreased during the post-lockdown period. However, for some food items (such as beef, wheat, kales, and tomatoes), the prices continued to rise between the pre-COVID and post-lockdown periods. Price increases for most food products were higher in the slums compared to non-slum areas. This could be because slum consumers have low incomes and therefore buy food in small quantities on a daily basis from small-scale slum vendors who, in turn, do not buy in bulk and stock fewer products to avoid food waste due to high perishability; this therefore results in higher unit prices particularly for perishable foods (Kimani-Maruge et al., 2014).

Prices for some commodities especially onions increased between pre-COVID-19 and lockdown periods and there was sharp decrease in prices during the post-dock down period, especially in the slum areas. This could be associated with the restricted cross-border trade during the lockdown period. Kenya imports a large amount of food produce especially onions, cereals, legumes, tomatoes, and eggs mainly from the United Republic of Tanzania and Uganda (FAOc, 2020). The level of imports from these countries was significantly affected by the pandemic especially during the lockdown period, a time when cross-border trade between Kenya and Tanzania was restricted. Trade restriction would result to less supply of onions in the country hence leading to sharp price increases (Mugo, 2020).

A number of important conclusions can be drawn from our study on the implications of the COVID-19 pandemic and from the government containment measures taken to reduce its spread for Nairobi urban vendors and the Nairobi food environment.

Firstly, the government measures put in place to curb the spread of COVID-19 are having negative repercussions on both vendors and the food environment, which determines consumers' dietary choices and ultimately affects their wellbeing. Slum (low-income) areas are more severely affected by government containment measures. It is therefore important that policymakers determine COVID-19 containment measures/policies that do not harm or hinder but rather that work best for slum (low-income) and non-slum food system actors as well as other food system actors. This may mean tailoring measures to the different food environment settings rather than broadly applying national-level measures.

Secondly, food systems and food environments underpin population health and contribute to social and economic wellbeing. It is therefore important for policymakers to design pandemic containment interventions that support/help ensure the availability of nutritious and affordable foods (fruits, vegetables, and animal-source products) to consumers during the different phases of the continuing COVID-19 pandemic.

Lastly, food safety is still a challenge in the Nairobi urban food environments. During the COVID-19 period, vendors and consumers have become more aware of the food safety challenges and vendors are trying to adopt measures to guarantee higher standards of food safety in their outlets. However, further research is needed to ascertain the kind of food safety measures being applied by the vendors and to measure the potential benefits of interventions, such as food safety trainings, for these vendors.

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Acronyms and abbreviations

CIAT International Center for Tropical Agriculture

FAO Food and Agriculture Organization of the United Nations

FFV Fresh fruits and vegetables

GAIN Global Alliance for Improved Nutrition

LMICs Low- and middle-income countries

MoH Ministry of Health

NGOs Non-governmental organizations

UN United Nations

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