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Article

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Cogent Business & Management

Provided in Cooperation with:

Taylor & Francis Group

Suggested Citation: Chari, Felix; Muzinda, Ozwel; Novukela, Cawe; Ngcamu, Bethuel Sibongiseni (2022) : Pandemic outbreaks and food supply chains in developing countries: A case of COVID-19 in Zimbabwe, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 9, Iss. 1, pp. 1-13, <https://doi.org/10.1080/23311975.2022.2026188>

This Version is available at:

<https://hdl.handle.net/10419/288314>

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To cite this article: Felix Chari, Ozwell Muzinda, Cawe Novukela & Bethuel Sibongiseni Ngcamu (2022) Pandemic outbreaks and food supply chains in developing countries: A case of COVID-19 in Zimbabwe, Cogent Business & Management, 9:1, 2026188, DOI: [10.1080/23311975.2022.2026188](https://doi.org/10.1080/23311975.2022.2026188)

To link to this article: <https://doi.org/10.1080/23311975.2022.2026188>



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Published online: 17 Feb 2022.



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Received 12 August 2021
Accepted 2 January 2022

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OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

Pandemic outbreaks and food supply chains in developing countries: A case of COVID-19 in Zimbabwe

Felix Chari^{1*}, Ozwell Muzinda², Cawe Novukela¹ and Bethuel Sibongiseni Ngcamu³

Abstract: The COVID-19 pandemic took a devastating human and economic toll on the entire globe. Although Africa had fewer number of cases compared to all other continents, the influence of the COVID-19 pandemic on food supply chains was devastating, yet the pathways through which it affected the continent remain poorly documented and understood. With this background in mind, this study explored the ways in which food supply chains were disrupted by COVID-19 in Zimbabwe. The study used a qualitative methodology and a descriptive survey with 32 participants from food supply chain networks. The results reveal that due to COVID-19 restrictions, food supply chains were disrupted right from the production stage, transportation stage up to access markets. More specifically, COVID-19 restrictions negatively affected production and supply of food items. Secondly, transportation of food supplies was adversely affected as haulage companies as well as local suppliers and importers had challenges getting lockdown exemption letters. Thirdly, COVID-19 restrictions increased the demand for food stuffs as consumers stockpiled to ensure their food security. Lastly, COVID-19 pandemic increased food prices as consumer expenditure on food items increased. This study contributes to the body of knowledge since, to the best knowledge of the authors, it is the first study to identify and address the consequences of COVID-19 pandemic on food supply chains in Zimbabwe. This study is also significant to policy makers and practitioners in the optimization of food supply chains in possible subsequent waves and future pandemics.

Subjects: Economics; Business, Management and Accounting; Industry & Industrial Studies

Keywords: coronavirus; pandemic; supply chain; food supply chain

PUBLIC INTEREST STATEMENT

This study explored the ways in which COVID-19 disrupted food supply chains in Zimbabwe. The study relied on interviews with 32 participants from food supply chain networks whose results were triangulated with secondary data from published newspaper articles. The results reveal that restriction of people movement crippled subsistence farming, commercial farming, and agro food processing. There were difficulties distributing food supplies both within local suppliers and imports and food price skyrocketed. Furthermore, demand for food stuff increased. This study contributes to the body of knowledge since it is the first to identify and address the consequences of COVID-19 pandemic on food supply chains in Zimbabwe. This study is also significant to policy makers and practitioners in the optimization of food supply chains in possible subsequent waves and future pandemics.

1. Introduction

A pandemic is a global epidemic that can greatly increase mortality and cause significant economic, social, and political disruptions (Maurice, 2016). Human history has witnessed many public health incidents where pandemics occurred with widespread human and economic suffering. Pandemics affect the generality of livelihoods across the globe disturbing the complex food supply chain networks. The outbreaks of pandemics have increased in frequency in recent years (Jones et al., 2008; Morse, 1995; Rewar et al., 2016;). Notably, the world experienced various outbreaks such as H1N1 Flue in 2010, Spanish Flu 1918, Hong Kong Flu, H7H9, Zika and Ebola 2013–2014, and the latest novel coronavirus (COVID-19), whose effects on the food supply chain networks is the main focus of this research.

COVID-19 origins are attributed to the city of Wuhan in China. The virus spread across the globe through the movement of people. Europe became the first epicentre outside of China, followed by the United States of America (Horowitz, 2020). According to the World Health Organisation (WHO; 2020) statistics, by 30 August 2020, the virus had infected more than two million people worldwide—making it the highest classification of any disease outbreak. Zimbabwe confirmed its first COVID-19 case on 21 March 2020, and cases rapidly increased to 5745 by 20 August 2020 (OCHA, 2020). On 30 March 2020, the government placed the country on a nationwide lockdown that closed borders and imposed travel restrictions to slow down the spread of infection. Unlike the previous pandemics in Zimbabwe—such as HIV/AIDS—that directly affected food security through reduction in food availability due to falling production, loss of family labour, and declining income for food purchases; COVID-19 brought all that on in the single swipe of a lockdown (Muzari et al., 2014). The COVID-19 induced lockdown restrictions severely affected economies the world over in general, and third world economies in particular. Anxiety about the lockdown restrictions and the implications of the virus on food supply chains induced international food insecurity. The impact of natural disasters on food supply chains is increasing significantly and has notably turned into humanitarian crises in the past (Food and Agriculture Organization (FAO), 2018). This study explores the ways in which food supply chains were disrupted by COVID-19 pandemic induced lockdown in Zimbabwe.

The food supply chain structure in Zimbabwe is largely shared between local agricultural produce, and agro-processed goods; the bulk of which comes from South Africa, Zambia, Namibia, Mozambique, Botswana, Malaysia, Vietnam, India, and China (Mutambara et al., 2013). The informal sector dominates the market of farm produce coming from both large- and small-scale commercial farming, as well as excess from households' subsistence farming (Chasi, 2003). Thus, the structure of food supply chain in Zimbabwe is a complex network of supply chains that draws from both offshore, near shore, and onshore supplies (Mutambara et al., 2013; Rukasha et al., 2021). Studies on COVID-19 and supply chain activities remain scarce, especially in food supply chains. After analysing the literature, it has emerged that most studies have concentrated on Canada, India, and the United States (Deaton & Deaton, 2020; Lemke et al., 2020; Mehrotra et al., 2020; Reardon & Swinnen, 2020; Richards & Rickard, 2020; Saurav et al., 2020; Sharma et al., 2020; Singh et al., 2020). However, infection rates were heterogeneous across countries and idiosyncratic country-specific lockdown strategies were implemented to manage the pandemic situations. It is therefore important to have country-specific studies that would help to develop customized strategies for dealing with the COVID-19 pandemic and any other future pandemics. This study therefore addresses the following overall research objective: *To establish the ways in which food supply chains were disrupted by COVID-19 induced lockdowns in Zimbabwe.*

The rest of the article is organised as follows: The next section outlines the literature review. Section three is the methodology section, and presents the methods used in this study, while section four presents and discusses results for this study. Section five presents conclusions and recommendations, while section six gives limitations of this study, and recommendations for future studies.

Figure 1. Food supply chain.
Source: Naing (2008).



2. Literature review

The section looks at the concepts of pandemics, food supply chains, and has a brief discussion of actors in the food supply chain and how they were influenced by these pandemics.

2.1. Pandemics

Pandemics occur across countries or the globe, and affect large numbers of people. Medical texts agree that pandemics have key features that include worldwide extension of the disease, novelty, severity, high attack rates and explosiveness, minimal population immunity, are infectious, and contagious (Maurice, 2016). Pandemics have negative impacts on the health, economy, and security of global countries. The COVID-19 outbreak was no exception, affecting countries on a global scale. The impact was felt across every country, every economic and social sector operations (Guo et al., 2020). Such pandemics are a major cause of supply chain disruptions. Just like other types of disasters (cyclones, drought spells, and wars) which can cause food supply chain disruption, pandemics are offering an unprecedented challenge each time they occur (Reddy, Singh & Anbumozhi, 2016). This study sought to establish the ways in which the COVID-19 pandemic influenced food supply chains in Zimbabwe.

2.2. Supply chain

A supply chain is a sequence or processes in the production and flow of materials, information, and money to satisfy the final customer requirements (Chopra et al., 2018). It includes manufacturers and their suppliers, transporters, warehouses, retailers, and customers depending on the logistics flow. It also includes new product development, distribution, and customer service. The greater part of supply chain management involves managing risks at every stage of the chain to minimize disruptions (Ivanov et al., 2019). These risks to supply chain performance arise not only from the suboptimal interaction within the network but also from the external environment (Jüttner & Maklan, 2011). The supply chains are more often complex and they often interact with each other making it difficult to identify the key stakeholders. Business-to-business transaction data should therefore be monitored to identify key firms in the supply chain as these firms act as restrictions in supply chains (Carvalho et al., 2020).

2.3. Food supply chain

Food supply chain covers all activities from farm to fork, including processing, packaging, distribution, storing, and consumption (; Deaton & Deaton, 2020). It is an important component of a system of organizations and people involved in the distribution of food products and services, and any disruptions of the flow can be catastrophic. Disruptions to food supply chains refer to any significant breakdown in the flow of products or services between production and the final customer (Reddy, Singh & Anbumozh, 2016).

Kumara and Srivasa (2012) mapped the value chain of food delivery system with different stakeholders involved in the chain. They identified producers (agricultural farmers), agro-processors, food retailers, distributors, and consumers as key stakeholders in the food supply chain. The implementation of food supply chain management strategies involves identifying these members that are critical. Figure 1 is a brief schematic presentation of the food supply chain actors.

Producer farmers are key actors in the primary stages of the production and are normally farmers. Distributors move the food products from one point to another. Retailers are the final

players in the distribution systems and directly engage the final consumer. The consumers in the food supply chain conclude the chain with consumption activities.

2.4. Impact of pandemics on food supply chains

Studies (Deaton & Deaton, 2020; Korslund & Kasari, 2009; Richards & Rickard, 2020) show that pandemic outbreaks in general and the COVID-19 pandemic outbreak in particular influenced food supply chains in four different ways: food prices, food supply, food demand, and food transportation in developed as well as developing countries. The ways these pandemics affect different countries are different given that infection rates and strategies to address the pandemic situation are different. This section explores the ways in which pandemic outbreaks influenced food supply chains.

The patterns in the previous pandemics show negative impacts on pricing of food items. During the Ebola outbreak, food prices remained relatively stable in the first half of the year 2015. This was owing to a good harvest during the previous year. However, food prices increased towards the end of year 2015 due to low food supplies, owing to poor agricultural productivity due to pandemic outbreak (World Food Programme (WFP), 2017). Similarly, the Spanish flu outbreak affected farming in the whole of Europe, leading to low output and high food prices. It can however be noted that the Spanish flu outbreak came during the First World War, and that also contributed to food shortages (Garrett, 2007). Unlike the Ebola effect, the H1N1 flu resulted in a widespread decrease in demand for pork and pork products leading to a fall in both sales and, subsequently, prices (Korslund & Kasari, 2009). The drop in pork prices was as a result of consumers linking the virus outbreak with consumption of pork products and not because of high supplies (Korslund & Kasari, 2009). Conversely, Gupta et al. (2021) predicted that during pandemic non-disrupted suppliers will increase prices as other suppliers are affected by disruptions. The current study provides valuable information on the implications of COVID-19 induced lockdown on food prices in Zimbabwe.

Pandemic outbreaks have direct impact on food demand as the levels of income are directly related to expenditure (Verikios & Sulluvian, 2011). The direct economic effects of pandemics on humans is that of increased healthcare expenditure, and an increase in job losses, leaving the public with less disposable income. This was seen in the fall of rice demand in Central Africa during the Ebola outbreak. The fall in demand then was due to lower income among consumers against higher prices pushed by higher export demand (Food and Agriculture Organization (FAO), 2018). During the SARS outbreak in Asia the demand for food suddenly dropped. Demand for food from both supermarket and restaurants slumped, mainly in China (Korslund & Kasari, 2009). The movement restrictions imposed led to demand shock particularly on consumption (Shannon & Willoughby, 2004). SARS was then summarised as affecting economic growth due to reduced demand. Similarly, demand for pork products dropped drastically during the H1N1 influenza outbreak both in Asian and overseas markets as consumers linked the outbreak to pork consumption (Korslund & Kasari, 2009). Researches (Deaton & Deaton, 2020; Gray, 2020; Lemke et al., 2020; Mehrotra et al., 2020) carried out so far in Canada and the US show that when COVID-19 broke out, there was a surge in demand for food as governments implemented various policies to curb the spread of the virus. Deconinck et al. (2021) also established that COVID-19 pandemic caused a surge in retail demand for food in France, Germany and the United States. There being no similar study carried out in Zimbabwe at the moment, this study will give insight into how COVID-19 induced lockdown influenced demand for food in Zimbabwe.

During the past pandemic outbreaks, transportation of food supplies was always regarded as essential services. However, just as during the Ebola outbreak, people were afraid of going out to work in fear of contracting the disease (Shultz et al., 2016). This resulted in few people volunteering in transportation of food supplies during the food assistance programmes (Food and Agriculture Organization (FAO), 2018). A study on COVID-19 by Richards and Rickard (2020) notes that transporters in Canada faced labour and logistical constraints to move vegetables. Given the

extent to which the pandemic spread across the globe, and the measures taken to combat it were different, it is imperative for these researchers to establish the implications it had to the transportation of food supplies in Zimbabwe.

Pandemics outbreak likewise influence agricultural production. Literature examining the impacts of the Spanish flu showed that in America and Europe, farming activities were severely reduced and suffered double digit losses (Garrett, 2007). Human mortality reduced the supply of farm labour. This affected prices at the end of farm produce supply chain (Brainerd & Siegler, 2003). Food and Agriculture Organization (FAO; 2018) also notes that when the Ebola virus (2014/2015) struck, it wreaked havoc across central and western Africa disrupting rice (the main staple food) harvesting in Central Africa. Rice production across Central Africa uses labour-intensive methods involving teamwork in different stages of production mainly during planting and harvesting (Food and Agriculture Organization (FAO), 2018). A study by Shultz et al. (2016) revealed that due to fear of infection farmers were not willing join production teams leading to rice shortages across Central Africa. In Liberia, for example, 47% of farmers were not able to cultivate their land due to the outbreak of Ebola (Shultz et al., 2016). However, the effects of Ebola on rice shortages did not spill over across the whole world as other major suppliers in China, India, and Southern Africa continued to feed the supply chains (Shultz et al., 2016).

In a similar study by Brahmbhatt (2005) on the effects of Avian flu in Asia, it was established that the pandemic reduced poultry products supply. Poultry losses meant financial losses and affected the poultry supply chain and the food sector as a whole. Absenteeism from work, and disruption in business activities and production processes led to food supply chain shocks at the national and global level (Brahmbhatt, 2005). In a study of OECD countries on COVID-19, Deconinck et al. (2021) noted that farm production of fruits and vegetables suffered due to labour shortage as lockdown measures limited the mobility of people.

The above review reveals that there are some published articles focusing on COVID-19 pandemic showing food supply chain was affected. However, such studies are still scarce in some regions and countries. Furthermore, most studies done on COVID-19 disruption of the supply chain have been in non-food sectors; for example, Paul et al. (2020) studied the disruption of transportation in pharmaceuticals in Bangladesh, while Fartaj et al. (2020) studied transportation disruption in automotive industry in the same country. However, studies carried out so far show that the extent of disruption depends on the industry and country hence the need for different studies for different industries and countries. Since studies (Lemke et al., 2020; Mehrotra et al., 2020) have revealed that different countries have had different experiences with the pandemic, the objective of this study is to investigate ways in which the COVID-19 induced lockdown affected food supply chain in Zimbabwe.

3. Methodology

3.1. Data

The main objective of this study was to identify and synthesise the ways in which food supply chains in Zimbabwe were disrupted by COVID-19 induced lockdown. To address this objective, the study adopted an interpretive research paradigm. The approach requires the social phenomena to be appreciated through the views of participant supply chain stakeholders and not the researchers (Guba & Lincoln, 1994). The qualitative inquiry was appropriate as it seeks to establish the views of the participants with rigor, precision, systematic and careful attention to detail (Richards, 2003). Primary data was collected from supply chain stakeholders in food supply chains that included farmers, food processing entities, food retailers, transporters and consumers across the country through semi-structured in-depth interviews. The researchers probed the interviewees to further explore points as they arose during the interview. The supply chain stakeholders' populations were grouped into strata, followed by purposive sampling to come up with 32 participants, with a fair representation from the different groups. Purposive sampling enabled the researchers to get

pertinent information to address the research objective (Sekaran & Bougie, 2016). The study used intra-method triangulation by adopting two qualitative data collection tools simultaneously to enhance trustworthiness of the findings (Carter et al., 2014). Secondary data gathered from newspaper articles was triangulated with primary data from in-depth individual interviews to achieve credibility, dependability, and transferability (Sekaran & Bougie, 2016). Data saturation and similarities in responses among interviewees also validated the research instrument and the accuracy of responses (Stevenson & Mahmut, 2013).

3.2. Analysis

The analysis of data was based on interpretive philosophy through examining meaningful and symbolic content of qualitative data (Patton, 2014). The data generated through in-depth individual interviews were analysed using NVivo Version 12, a computer-aided qualitative data analysis software and presented in vignettes. Thematic analysis was applied on gathered data to identify common issues that recurred and establish the main themes (Patton, 2014). Using NVivo, data from interviews were transcribed, and responses to each question were grouped and coded to develop themes.

3.3. Ethical considerations

It is worthwhile to note that all participants in this study did so voluntarily (Carter et al., 2014). No incentives were handed out, which might have resulted in some persuasion. All respondents' right to privacy was maintained, and no names and identification were asked for in the process. Full consent of participants was obtained before the survey. The researchers assured participants that data collected would remain confidential in order to obtain and report rich detailed data (Sekaran & Bougie, 2016). Furthermore, the researchers ensured that other researchers' findings were acknowledged. The researchers also avoided explicit, defamatory and offensive language during the structuring of the interview guide and write-up of this paper in a bid to remain ethical during the study (Fouka & Mantzourou 2017).

4. Results and discussion

4.1. Demographic characteristics

The demographic characteristics of respondents are shown in [Table 1](#).

Findings in [Table 1](#) show 62.5% of the participants were male and 37.5% were female implying a male dominated food supply chain. Results from the table also show that a large proportion of participants (31.2%) were in the age range of 41–50 years, while 21.9% of the participants were in the age range of 31–40 years, and 21.9% were between 51 and 60 years. It can therefore be interpreted that a large proportion of stakeholders in food supply chain are relatively mature with ages above 31 years. The table further indicates that a large proportion of participants (46.9%) had a first degree as their highest level of educational qualification, as compared to 25.0% of participants with diplomas, and 15.6% with postgraduate qualifications.

4.2. Food supply chains disruptions during COVID-19 pandemic

Findings from this study reveal four specific themes emerging from interviews with participants. The themes were identified as

- supply of agricultural produce;
- food prices;
- transportation of food supplies;
- demand for food.

[Table 2](#) shows the frequency in which each theme was raised.

Table 1. Demographic characteristics of respondents

Demographic characteristics		Sample size	Percentage (%)
Gender	Male	20	62.5
	Female	12	37.5
Age	≤30 years	05	15.6
	31 ≤ years ≤40	07	21.9
	41 ≤ years ≤50	10	31.2
	51 ≤ years ≤60	07	21.9
	≥61 years	03	09.4
Supply chain stakeholders	Farmers	10	31.2
	Food processors	04	12.5
	Food retailers	12	37.5
	Transporters	06	18.8
Experience in supply chain management	0 ≤ years ≤ 5	04	12.5
	6 ≤ years ≤ 10	06	18.8
	11 ≤ years ≤ 15	10	31.2
	≥16 years	12	37.5
Level of education	O Level	04	12.5
	Diploma	08	25.0
	Degree	15	46.9
	Postgraduate	05	15.6

Table 2 reveals all the participants (100%) agreed that COVID-19 pandemic affected the supply of agricultural produce and 94% pointed to its adverse effect on food prices. The table also shows that the majority of stakeholder participants (94%) faced problems transporting food supplies due to the impact of COVID-19, while 88% of the participants shared the same view that lockdown restrictions increased demand of food stuff. The subsections below give a detailed presentation, interpretation and discussion of the themes.

4.2.1. Supply of agricultural produce

The informants shared same sentiments that in Zimbabwe most of the agricultural products are sold on the open market area, and the lockdown measures implemented by the government resulted in closure of these farm produce markets. Government's orders to lock down the country and urging of people to stay at home rocked the nation's food supply chain, with many farmers failing to deliver produce to the market. Vegetable farmers were hit harder due to the perishable nature of vegetables. One farmer from Domboshawa, a small township north of the capital city, Harare, cried foul on the availability of market for tomatoes:

Most farmers had a good tomato harvest but access to market places remained a challenge despite government's easing of restrictions on food producers as essential services. (Farmer from Domboshawa, 24 May 2020)

A local online newspaper concurred that production was disrupted as it reported:

Marketing and distribution of fresh farm produce was severely impacted by COVID-19, in the first week of the national lockdown, fresh farm produce markets like Mbare Musika in Harare were completely closed. During this period, farmers were stranded with their produce especially perishables such as green vegetables and tomatoes. (Great Dyke News 24, April 18, Great Dyke News 24, 2020)

Table 2. Frequency table

Theme	Sample size	Frequency	Percentage (%)
Supply of agricultural produce	32	32	100
Food prices	32	30	94
Transportation of food supplies	32	30	94
Demand for food	32	28	88

These findings are supported by some previous studies. During the Ebola outbreak, food supplies were negatively affected as people quarantined in fear of contracting the disease (Shultz et al., 2016). A study on COVID-19 by Richards and Rickard (2020) also revealed that Canada faced constraints in the supply of vegetables due to lockdown measures implemented by the government.

On the production side, one of the maize farmers from Beatrice farming area also commented that government restrictions hampered harvesting efforts as it was difficult to transport workers to farms during the lockdown period. Farmers pointed out that, the workers were not afraid to come to work because of fear of the virus in particular, but only because of tight lockdown restrictions. It also follows that restriction of people movement crippled subsistence farming, commercial farming, and agro food processing entities which are critical players within the supply chain. Some giant retailers supplemented this gap by importing more farm produce, as they were given clearance from relevant government ministries.

Our local suppliers are falling short of the quantities needed especially on vegetables like onions and cabbage, therefore we now import from South Africa and Zambia. At this time of the season, these vegetables usually flood the market. (Procurement Manager at a Food processing plant at Bulawayo, 16 May 2020)

The COVID-19 pandemic shows the same effects as the 1918–1919 Spanish Influenza where farming activities were severely reduced and farmers suffered double digit losses (Garrett, 2007). However, unlike the Spanish flu, in Zimbabwe the supply of farm labour force was not severely reduced by high mortality rate but rather by tightened movement restrictions. These results concur with empirical research (Bouey 2020) in Latin America and Canada, which found out that lockdown restrictions associated with the COVID-19 pandemic affected agricultural input supply chains. Livestock production was hit hard with significant implications to meat supply chains. Fishing industry found access to markets particularly difficult. Deconinck et al. (2021) also noted that farm production of fruits and vegetables in OECD countries suffered due to labour shortage as lockdown measures limited the mobility of people.

4.2.2. Food prices

Results of this study point to an increase in food prices that was viewed as significant and unbearable. One of the Procurement managers from a retailer that supplies food had this to say:

The price of a 10 kg bag of maize meal has gone up beyond the reach of many, and it has become unbearable for most of them and because of that the government has subsidized mealie-meal which is now in short supply. (Procurement manager at Harare, 20 May 2020)

Findings from the majority of respondents pointed out that there was a significant decline in the purchasing power of consumers, thereby stagnating market-related activities. However, one of the respondents, a small-scale grocery trader, pointed out that most of the basic food prices were up due to a shrink in supplies, which was simultaneously accompanied by a dramatic surge in

demand of basic food stuff as the nation prepared for tough times ahead during lockdown. He said,

We have experienced more stock outs as people queued for basic food commodities when the President announced the first 21-day lockdown. We have also subsequently been unable to refill our shelves because our suppliers are also experiencing shortages. When supplies become available they will be accompanied by a high new price tag. (Procurement Manager at a Retail shop at Bulawayo, 15 May 2020)

The food price increase is also corroborated by a newspaper publication: “We can’t get adequate stocks and many here are now raising prices to take advantage of demand outstripping supplies. Many are profiteering from this coronavirus crisis” (The Herald, 31 March 2020).

Another publication noted that there was a huge price jump in basic food commodities like bread, cooking oil, sugar, and unsubsidised mealie-meal by an average of 33%: “Bread price, for example, rose by around 33 percent from an average \$20 to \$30, while cooking oil now costs anything between \$120 and \$160 for two litres, up from \$70 depending on brand and the retailer” (Centre for Innovation and Technology (CITE), 2020, April 23).

There are notable similarities on impact of the COVID-19 pandemic on food prices when compared to previous pandemics. This is also confirmed by Gupta et al. (2021) prediction that during pandemics non-disrupted suppliers will increase prices as other suppliers are affected by disruptions. Although during the Ebola outbreak food prices remained relatively stable in the first half of the year 2015 owing to a good harvest during the previous year, food prices increased sharply towards the end of year 2015 due to low food supplies (WFP 2015). Similarly, the Spanish flu outbreak affected farming in the whole Europe leading to low output and high food prices. It can be however noted that Spanish flu outbreak came during the First World War and that also contributed to food shortages (Garrett, 2007). Unlike the COVID-19 effect, the H1NI flu resulted in a widespread decrease in demand for pork and pork products leading to fall in both sales and subsequently prices.

4.2.3. *Transportation of food supplies*

The results show that many small-scale farmers and traders faced transportation problems due to the impact of COVID-19. However, giant players were able to get clearance from the government to continue movements. One respondent from a giant retailer indicated that it was easier to pass security roadblocks with their branded vehicles. There were notable challenges getting food imports in the country as borders were partially closed. A Logistics officer from with one reputable transporter said,

Trucks now spend twice the time on the border as compared to before COVID-19 crisis mainly because the boarder has scaled down its workers per shift in response to Covid-19. This in return has created long lead times in the food supply chain. (Logistics Officer from Gweru, 24 May 2020)

However, small-scale traders with no proper permits found it more difficult to pass through security blocks hindering food delivery efforts, let alone finding the market.

Despite the president regarding food supplies as essential services, we the small retailers are still facing challenges as we do not have access to authorisation letters to ferry our supplies and we are largely regarded as informal sector. The president said the informal sector is banned. (Procurement professional from Bulawayo, 16 May 2020)

This is also supported by a report from a daily newspaper, *The Chronicle* which noted that: “Farmers suffered due to movement restrictions and collapse of the markets as getting permits from Agritex and local authorities is taking days to facilitate transportation of agricultural produce” (*The Chronicle*, 2 August 2020).

The above results showed that COVID-19 changed the way businesses operate from dealing with the government-imposed restrictions and balancing the customer demand. Similarities in how the past pandemics affected the food supply chain are notable. The Spanish flu of 1918 and Ebola hugely impacted both production and movement of food commodities across Europe and Central Africa, respectively (Food and Agriculture Organization (FAO), 2018). Richards and Rickard (2020) also found that transporters in Canada faced labour and logistical constraints to move vegetables during COVID-19.

4.2.4. Demand for food

Most of the respondents shared the same view that at the start of lockdown restrictions there was an increase in demand of food stuff mainly basic food stuff as consumers were bracing for unprecedented challenges of COVID-19. Queuing of large numbers of customers was observed on the day the national lockdown was announced by the Government. This corroborates with an article published in *The Herald* “In Zimbabwe and other neighbouring countries, panic buying has seen a number of retail outlets being emptied as consumers stocked up food and other essential items to survive the lockdowns” (The Herald, 31 March 2020).

The above observation concurs with Deconinck et al. (2021) who noted that COVID-19 pandemic caused a surge in retail demand for food in France, Germany and the United States.

Conversely, study results reveal that demand later began to fall down. This could be due to fall in household incomes as lockdown measures crippled money generating activities. A respondent who is a vendor of farm produce was concerned about how her job, of selling at a food market to generate income, was affecting her disposable income. The vendor said,

We are not going to work, we operate as small indigenous shops in downtown Harare, no work no money to buy food. (Vendor from Gweru, 20 May 2020)

In Zimbabwe, a large number of people rely on informal businesses and lockdown measures affected their incomes. Aggregate demand was negatively affected due to loss of income by employees across various industries. The findings corroborate with empirical research in Latin America on the impact of COVID-19 on food supply chains that once the panic buying ceased and the lockdown measures start to affect people’s incomes there was fewer grocery store visits and largely dampened demand (Mussell et al., 2020).

5. Conclusions and recommendations

The paper sought to determine the ways in which COVID-19 pandemic disrupted food supply chain in Zimbabwe. The study found that the pandemic has disrupted the food supply chain in so many ways across different sectors in the food industry. It was found that food supply chain was disrupted right from the production stage, transportation stage, up to access to markets. More specifically, it was found that prices of food commodities increased and at the same time the consumer’s purchasing power decreased due to lockdown restrictions. Secondly, the study found that there was no ease of movement on food supplies both within local suppliers and importers which created long lead times in the food supply chain. Thirdly, the study found that at start of lockdown restrictions there was an increase in demand for food staff, while in the long-run, demand fell as household incomes dwindled as lockdown measures crippled money generating activities. Finally, Government’s orders to lock down the country reduced the nation’s food supply chain, with many farmers failing to deliver produce to the market.

The results of this study are important for informing policy makers on appropriate policy response to subdue such pandemic impact. The researchers recommend the Government of Zimbabwe to implement policies to ensure smooth flow of agricultural activities, during such pandemics, to ensure supply continuity as they are one of the main sources of livelihoods. The government must also engage both large- and small-scale farmers to facilitate movement of workers to and from work with minimum difficulties. More so, there is need to exempt all food

transporters from any such lockdown restrictions during pandemics, giving consumers reliable access to food markets. Similarly, food aid distribution programs by non-governmental organisations must be facilitated to address food insecurity that is prevalent in vulnerable communities.

6. Limitations and recommendation for future studies

This study was done at the start of the COVID-19 pandemic and its effects on food supply chains are still going on and look increasingly devastating, therefore certain evidence may surface as the pandemic continues to spread at an exponential rate. In future, one promising research avenue would be to look at the effectiveness of supply chain strategies to mitigate the disruptive effects of COVID-19 and achieve resilience.

Funding

The authors received no direct funding for this research.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Citation information

Cite this article as: Pandemic outbreaks and food supply chains in developing countries: A case of COVID-19 in Zimbabwe, Felix Chari, Ozwell Muzinda, Cawe Novukela & Bethuel Sibongiseni Ngcamu, *Cogent Business & Management* (2022), 9: 2026188.

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