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Informal vendors and food systems planning in an emerging African city

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ABSTRACT

Rapid urban growth is straining infrastructures, economies, and food security of cities in sub-Saharan Africa (SSA). Amid competing issues of sanitation, housing, and unemployment, planning for urban food security receives less attention. Despite the proliferation of supermarkets in SSA, informal food vendors remain crucial sources of food for the majority of households. However, as cities grow and planners try to adapt, these informal vendors are generally left out of planning considerations, marginalized by policies that do not support this business model, or subjected to political vicissitudes. This paper analyzes how vendors in emerging cities are economically, socially, and spatially integrated within the urban food system, highlighting the assets these vendors represent and the ways they might support growth in cities. We map vendors' networks of food suppliers, and describe sources of operating capital and labor assets to show the range of services vendors utilize and the types of institutions, businesses, and individuals that vendors use to support their work. We spatially analyze the relationship between vendors and suppliers, and between vendors and households, to demonstrate how enmeshed these vendors are in the broader food system and the links they create between consumers and suppliers. We demonstrate that due to spatial differences and vendors' and consumers' needs in emerging cities, a one-size-fits-all approach for integration of informal vendors in the food system is less likely to be successful in terms of either economic development or household food security.

1. Introduction

Globally, over half the population lives in urban areas, with that proportion expected to grow to 68% by 2050 (UN DESA, 2019). The population of sub-Saharan Africa (SSA) is expected to shift to a majority of urban residents around 2035 (UN DESA, 2019). Such rapid population and urban growth present challenges for infrastructures, economies, and food security in cities in SSA. Prioritization of sanitation, housing, and employment means that planning for urban food security of residents receives less attention. To date, the majority of food security research in SSA has focused on rural production and food availability (Crush and Frayne, 2010; Crush and Riley, 2019), although focus is shifting to issues of food accessibility, particularly in the context of urban food security (Frelat et al., 2016). Most urban residents must purchase food rather than grow it for themselves, creating a need to understand the relationship between food accessibility and food security in urban areas. Limited access to food can mean that large swathes of urban areas face chronic food insecurity. The inability of current food systems to meet the food demands of urban residents in SSA has been referred to as "the emerging development issue of this century" (Crush and Frayne, 2010, p. 6).

Increasingly however, the challenge of urban food security is gaining policy prominence on global and regional agendas. For instance, with the signing of the Milan Urban Food Policy Pact[1] in 2015 and the launch of the New Urban Agenda[2] a year later, national and local policymakers have gradually acknowledged the need to strengthen urban food systems to provide affordable and nutritious food (UN, 2017). Other initiatives include the C40 Urban Food Systems Network[3] and the Food and Agriculture Organization's Food for the Cities Programme[4] that examines city-region food systems. All of these initiatives acknowledge that inequalities in urban housing and employment pose distinct challenges for food accessibility and affordability and require a more comprehensive

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[1] http://www.milanurbanfoodpolicypact.org/.
[2] http://habitat3.org/the-new-urban-agenda/.
[3] https://www.c40.org/networks/food_systems.
[4] http://www.fao.org/in-action/food-for-cities-programme/en/.

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policy response rather than a purely sectoral focus on agriculture.

The urban food system landscape in SSA features a range of retailers and producers that households may patronize, including small local grocers and specialty shops like butchers, local farmers, formal marketplaces, informal or street vendors, and supermarkets, which continue to make significant inroads in urban areas of SSA (Blekking et al., 2017; Reardon et al., 2003; Reardon and Timmer, 2012). However, informal food vendors in particular are crucial sources of food for the majority of households in SSA (Battersby and Watson, 2018a, 2018b; Crush and Frayne, 2011; Roever and Skinner, 2016). Informal food vendors are individual food retailers who generally operate outside the formal food provisioning system and in many contexts are conducting business without legal status or protection. In Zambia, such vendors are a heterogeneous constituency. Street vendors who violate zoning codes by operating in public spaces, such as the sides of roads or outside established markets, are technically illegal based on Statutory Instrument No. 44 of 2007 (amended in 2018 under the Local Government Act Statutory Instrument No. 12), deemed a "public nuisance," and face range of fines. In addition, the Public Health Act as well as the Food and Drugs Act govern when and where local authorities can seize foods that are deemed unsafe and unfit for consumption, and can fine traders accordingly (Skinner and Haysom, 2016). Vendors who work within markets—known as marketeers—are legally allowed under the 2007 Markets and Bus Stations Act; however, due to either ignorance of regulations or poverty, some may not have obtained the proper business licenses and food safety permits, or do not comply with the council fee structure established for selling from a stall or table.

Vendors' treatment by policymakers in Africa has thus far ranged from benign neglect to outright repression. When urban policymakers in SSA do plan for or enact measures to manage urban food systems, informal vendors are increasingly left out of planning considerations, or are marginalized by policies that do not support this business model, often in the name of "modernizing" cities (Battersby and Watson, 2018a; Berger and van Helvoirt, 2018; Smit, 2018; Wanyama et al., 2019). At worst, vendors are harassed and forcibly removed or relocated, their wares and stands confiscated or even destroyed. Such actions ignore vendors' integral role in addressing spatial disparities in the food system (Benson et al., 2005; Okwi et al., 2007). For example, households on the urban periphery may be more closely linked to production areas for their food access, while those in the town center may rely more on shops (Anand et al., 2019).

Given the growing focus on urban food security, what role can informal vendors play in supporting urban food systems, and what support do they need to ensure such food systems are resilient? This paper utilizes data on informal vendors' personal networks coupled with household survey data collected in the town of Mumbwa, Zambia. The analysis reveals how vendors are economically, socially, and spatially integrated in the urban food system and illustrates spatial aspects of both vendors' utilization of food suppliers and household food sourcing from vendors. We argue that policies and planning for urban food systems in SSA must include informal vendors, but furthermore, that in terms of integrating vendors in the food system, a one-size-fits-all approach is less likely to be successful in terms of either economic development in the informal sector or household food security. In doing so, we continue to shift conversation to focus on the assets that street vendors can provide for rapidly urbanizing cities in SSA, rather than viewing them as a policy nuisance or a political tool, as when candidates for office selectively enforce or ignore anti-vending laws in order to win votes from particular constituencies (Resnick, 2019).

2. Background

By 2030, a majority of the global urban population is projected to live in cities of fewer than one million people (Shifa and Borel-Saladin, 2018). Urbanization in SSA is a dynamic process that is happening very rapidly, is unique across locations and histories, and is not well understood (Fox, 2012; Mitlin and Satterthwaite, 2013; Potts, 2011; UN DESA, 2018). Although primary cities, those large cities that often serve as national administrative centers (e.g., Lusaka, Nairobi, Accra), will continue to grow, smaller, secondary cities (often defined as having a population between 100,000 and 500,000; UN DESA, 2018) will witness the majority of population growth, particularly in Africa and Asia.

A significant proportion of the urban population in SSA is engaged in informal employment. "Informal" refers to "income generating activities that operate outside the regulatory framework of the state" (Meagher, 2013, p. 2). The view of two separate economies, formal and informal, is no longer generally accepted. Instead, scholars and practitioners recognize that the formal and informal intersect and are linked in various ways (Chen, 2012; Meagher, 2013). Central to our contribution is this concept of linkages, as we examine the ties informal vendors have with a range of individuals and businesses. These informal vendors are part of the informal economy but are also key nodes in food systems in SSA more broadly.

Despite a large body of work on informality in African economies (e.g., Lourenço-Lindell, 2010; MacGaffey and Bazenguissa-Ganga, 2000), research focusing on informal vendors and their role in the food system is limited. This is especially true for those operating outside any kind of market structure – that is, those individuals operating fresh or prepared food vending enterprises either in place on the street, or on foot, mobile. Organizations such as FAO and Women in Informal Employment: Globalizing and Organizing (WIEGO) have collected statistics and reported on street vendors in African contexts (e.g., Chen, 2012; FAO, 2016a; Roever, 2014; Vanek et al., 2014), and scholars working with bodies such as the African Food Security Urban Network (AFSUN) have illustrated how important informal vendors are to ensuring food security among urban residents in SSA (e.g., Battersby et al., 2016). Others have highlighted the resilience of vendors as supermarkets spread across SSA (e.g., Nickanor et al., 2019) or revealed the power structures under which vendors must attempt to operate (e.g., Porter et al., 2007; Siame et al., 2021). In addition to informal vendors, household food sources also include small local shops selling mainly non-perishable goods, restaurants, food remittances and aid, urban agriculture, food sharing via social networks, and, increasingly in some parts of SSA, supermarkets. However, food access and sourcing are especially dependent on income and context. In urban areas, though households may shop across the range of informal and formal retailers, poorer households tend to rely more on informal vendors, while wealthier households shop more frequently at supermarkets (Battersby and Watson, 2018a, 2018b; Skinner, 2016). Informal food vendors provide poorer households with better opportunities to achieve food security by being spatially accessible and specifically serving such households by doing things like offering credit or "breaking bulk" (Battersby, 2012). Across SSA, over 70% of households rely on these vendors for food access by regularly sourcing food from them (Battersby and Watson, 2018b; Crush and Frayne, 2011).

For the vendors themselves, there has been a range of studies (Anku and Ahorbo, 2017; FAO, 2016a; Skinner and Haysom, 2016) that both illustrate the diversity among vendors (e.g., in educational level, nationality, to what degree vending is a survival strategy) and identify some general features of them: they tend to be self-employed or owner-operators, female, and crucial sources of employment, especially for women. They also typically do not have access to running water or electricity, yet they offer a wide range of prepared, packaged, and fresh foods (Battersby et al., 2016; FAO, 2016a; Resnick et al., 2019; Skinner, 2016). We also know that while urban informal vendors' activities, rights, and political awareness vary widely by city size and governance context, the common response of cities to these vendors has been repression (Brown et al., 2015; Kamete, 2007, 2009; Kamete and Lindell, 2010), although enforcement of repressive tactics also varies widely by the location and size of city governments (Resnick et al., 2019).

Regulators' concerns over informal vending include loss of business for formal retailers, street congestion, potential for increased crime in

areas of dense informal trading, loss of tourism because vendors are perceived to make cities look ugly or un-modern, and disease spread (Chileshe, 2020). In conjunction with a narrative that has evolved over time to cast informal vendors in a negative light (Potts, 2008), and inconsistent efforts to enforce anti-vending laws, attempts to enforce food safety and public health regulations have led to further fraught relationships between vendors and legal authorities. Vendors' knowledge and performance of proper hygiene and public health practices varies (e.g., FAO, 2016a; Mjoka and Selepe, 2017), and cities tend to be unable to consistently support and enforce food safety laws because of limited resources. In addition, vendors are not always able to comply with laws due to cost (e.g., required medical examinations) or low availability of services (e.g., infrastructure for laboratory tests; Monney et al., 2013). While cities and governments often maintain a "generally punitive approach to the informal sector, that focuses on regulation and control" (Skinner and Haysom, 2016, p. 14), in the long run, such repressive tactics have generally proved to be fruitless (Kazembe et al., 2019; Onodugo et al., 2016; Steel et al., 2014). Scholars and practitioners have encouraged planning departments to recognize the important role that informal vendors play in local food security and to include informal vendors in food system planning for cities: "Rather than resorting to draconian measures, governments across the continent must find ways to engage with informal workers that will ensure Africa's urban populations have adequate access to safe and nutritious foods" (Resnick, 2017, para. 7).

With this paper, we make two major contributions. First, we link three important sets of dynamics relevant to informal vendors in food systems in SSA: the critical role of informal vendors in urban food security (e.g., Battersby et al., 2016; Crush and Frayne, 2011; Skinner, 2016), their role in agricultural value chains (e.g., Reardon et al., 2003; Reardon and Timmer, 2012), and the way informal trade functions as a major source of income for the urban poor (e.g., Chen et al., 2004; Portes et al., 1989). As Roever and others have described, informal street vendors make important contributions to urban life beyond their own employment and food security of citizens (Roever, 2014). The ways that informal workers are linked to other parts of the economy generate demand for a range of other services, such as transportation, porters, and suppliers of goods (Roever and Skinner, 2016).

Empirically, however, these linkages between vendors and consumers on the one hand and vendors and food suppliers on the other have not been jointly analyzed. Using a unique set of data on both household consumption and vendors' business operations, we analyze vendors' networks of food sourcing, startup and lending, and labor assets to show the range of services vendors utilize and the types of places and individuals, across the continuum of economic formality, that vendors use to support their business. These places and individuals include formal and informal lenders, local farms, the central market, local shops, and family members, among others. Vendors are not merely surviving but are actively engaged with operating a business, drawing on multiple types of resources to do so and creating additional economic links in the city in the process.

We also directly link vendors to producer, distributor, and aggregator nodes, and integrate household-level food purchasing data to help illustrate spatial aspects of both vendor-supplier relationships and consumer utilization of vendors. We provide visualizations of vendor-supplier linkages, and spatially analyze the relationship between vendors and suppliers to test whether there are spatial differences in vendor utilization of the central market as wholesaler. We then add a spatial analysis of household utilization of informal vendors, identifying clusters of household food retail sourcing around vendors.

We examine these dynamics in the tertiary city of Mumbwa, Zambia. Urban food systems research in SSA and urban policy initiatives have been almost entirely focused on primary and secondary cities. However, a growing proportion of citizens in SSA live in tertiary cities, which are more numerous than secondary cities (UN DESA, 2019). According to Roberts (2014, p. 36), tertiary cities often serve as support for larger cities and may function as district- or provincial-level government centers, logistics hubs, or manufacturing or service industry centers. Tertiary cities in particular may be largely trade-based with high levels of informal employment (Roberts, 2014, p. 37). The World Bank (2017) refers to tertiary cities as agrocities–defined as agriculture towns and cities with under one million people—and notes that they face distinct policy challenges in terms of providing access to business skills for micro enterprises and sufficient dietary diversity to consumers.

Mumbwa is a compelling place to study an urban food system because it tells us something about the processes of growth and urbanization in a less densely settled environment. We can see how early interventions in food systems planning might ameliorate some of the dynamics of food security that have become so problematic in more mature cities across SSA. In a place like Mumbwa, where supply chains are shorter, the linkages between informal food vendors and farmers, processors, wholesalers, and consumers are clearer. As such, there are more opportunities for food policy interventions to strengthen these linkages to be more "strategic rather than responsive" (Battersby and Watson, 2018b, p. 205).

3. Study site and methods

3.1. Study site

In Zambia, 72 percent of the urban labor force is informally employed, which is defined as a lack of entitlement to annual paid leave and absence of social security (Central Statistical Office, 2015). Food retail is an especially critical sub-sector of informal employment, especially for women, who concentrate in fresh fruits and vegetables. Research in the capital of Lusaka suggests that the urban poor purchase more than 90 percent of their food from informal traders (Chileshe, 2013). In Kitwe, a major secondary city, 88 percent of households report sourcing from open-air markets and almost half claim to purchase their food from street vendors (Skinner, 2018). Yet, minimal research has been conducted on informal food vendors' importance and livelihoods outside the country's major cities.

As such, this study focused on collecting data in Mumbwa, Zambia, a small city about two hours west of Lusaka via tarmac road (Fig. 1). Buses run from Lusaka, the national capital, daily, and it is close enough that a small number of the vendors we interviewed reported that they procured food to sell from Lusaka. Mumbwa is a rapidly expanding city: shortly before data collection began, the city's boundaries had been extended (personal communication, Mumbwa council members, June 12, 2019), and there was ample evidence of new housing structures. Mumbwa is the capital of Mumbwa District, in Central Province. At the last census (2010), Mumbwa's population was 20,390, with a projected population growth rate of 3.3% (Central Statistical Office, 2012, 2013). The Zambian Air Force has a base in this district, and Kafue National Park is close by to the west. The district is largely agricultural, with some copper and gold mining industry, and the only Zambian-owned cotton ginnery is just outside of Mumbwa.

The food retail landscape in Mumbwa consists mainly of small local shops or grocers and informal street vendors, but includes wholesalers and one open-air traditional market. At the time of data collection in June 2019, a Choppie's supermarket was due to open in the fall, and some small shopkeepers were cleaning and updating their stores in anticipation of the increased competition. In terms of the policy environment around informal vendors in Mumbwa, government officials are guided by the federal Public Health Act, which lays out the acceptable ways food can be handled, and the Local Government Act Statutory Instrument No. 12 (Street Vending and Nuisances), which lays out sanctions for activities such as selling produce in any public place other than a market established by the local council. In Mumbwa, informal vendors may be harassed and are warned multiple times before having goods confiscated, and they also face fines for noncompliance with the law. Officials are more concerned to confiscate highly perishable goods

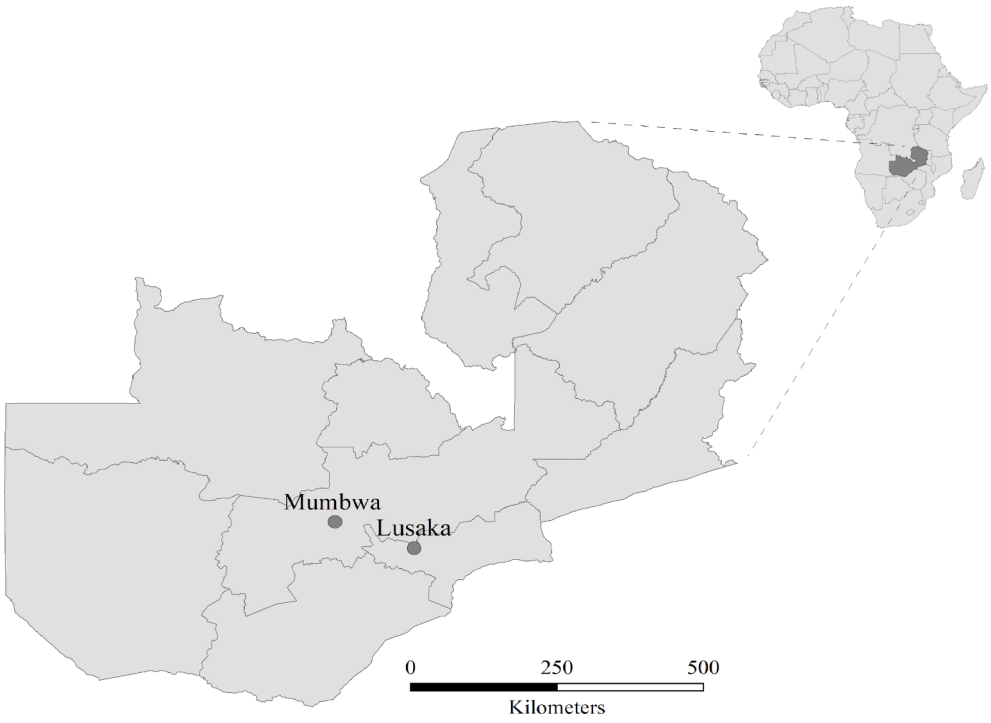

Fig. 1. Map of study area.

such as meat, dairy, and prepared foods, and all vendors are regularly encouraged to sell from the main market in town rather than in the street (personal communication, Mumbwa council members, June 12, 2019).

3.2. Data collection and analysis

In this paper we present data collected from informal street vendors and households. There is no existing sampling frame for informal street vendors. Given the size of Mumbwa and our resources, we attempted to traverse all streets in Mumbwa, including those in the residential areas, at least one time and interview all street vendors (including mobile vendors) who were selling at least one of five main staple foods: maize, tomatoes, greens (such as kale, rape or others), onions, or cooking oil. This food item criterion did not exclude many street vendors that we saw. We sought interviews on weekdays between 9:00 AM and 5:00 PM. We did not interview vendors who owned their own permanent storefront, nor did we interview any vendors who were established at formal (i.e., legally sanctioned) markets. Additional vendors sometimes sold in the main business district later in the evenings, but given that we had an all-female enumerator team, we decided not to pursue additional interviews after dark. From time to time a vendor was not at their stall and we were not able to interview them – reasons for absence ranged from running errands to one vendor who was in the house giving birth when we came by. We may also have missed vendors who only sold on the weekends, although the majority of vendors operated six days a week or more (81% of our sample). We are confident that we reached a large majority of vendors in Mumbwa who met our criterion for foods sold. Vendors were only interviewed if they were over the age of 18.

The data collection instrument for informal vendors asked vendors for information about individuals and entities that provided them different kinds of instrumental support in their business, and we used a software program specifically designed to capture personal network data (Enso, 2018). We asked about food suppliers for each of the five staple foods (maize, greens, tomatoes, onions, and cooking oil); anyone who lent the vendor money or gave them credit to help them get started with the business; anyone who currently lends money or gives credit on a regular basis to help keep the business going; anyone aside from any paid employees who helps regularly in the business or is involved in the business with the vendor; and anyone who helped the vendor get their business reestablished after having been forcibly removed. For each of these categories of people or places, we followed up with questions such as individuals' relationship to the vendor, which foods were sought from each supplier, and how others helped with the business. We also asked demographic questions and some additional questions about experiences with forced removal, barriers to business, ability to get a loan, and general questions about their businesses.

For household sampling, we focused on low and low-middle income residential areas, and used a stratified area random sampling method (Montello and Sutton, 2006). Sampled residential areas represent both formally-designated and informally-established residential areas. The northwest area of Mumbwa was not sampled because that area is primarily higher-income residential housing. We sampled a minimum of 30 households in each of the four sampled residential areas to ensure geographic distribution across areas of interest throughout Mumbwa. One household member over the age of 18 and with knowledge of the household food practices responded to the survey, although there were instances when multiple household members were present during the interview. When this occurred, the household member first contacted by the research assistant provided the final answer to questions. The household survey collected data on household demographics, assets, and food purchasing behavior.

We present descriptive data about vendors and households, and results from a spatial analysis using hot spot (Getis-Ord Gi*) detection and Kulldorff spatial scan statistic. Hot spot analysis is used to discern whether there are concentrations of vendors within Mumbwa that source more (less) from the traditional market, which is located in the central business district of Mumbwa. Vendors treating markets and other established shops or supermarkets as wholesalers is a common occurrence in Mumbwa as in other locations (Battersby et al., 2016; Nickanor et al., 2019). To identify spatial patterns in the differences in urban food accessibility, we use the Kulldorff spatial scan statistic to identify areas where there are higher (lower) than average values for the number of times a household visits informal vendors during a typical 14-day period.

4. Results

4.1. Vendor demographics and business characteristics

The survey instrument for vendors asked three main demographic questions: age, highest level of education completed, and sex. The vendors were primarily female (88%), ranged in age from 18 to 66 with an average and median of 35 years, and ranged in education from no formal schooling to having completed post-secondary school. The mean and median level of education was completion of primary school, with 43% of vendors having completed primary school and 7.5% having completed secondary school. In addition, male vendors on average completed more school than female vendors. Compared with vendors elsewhere in SSA, more vendors in Mumbwa had at least some formal schooling (about 89% versus 82%; FAO, 2016b), yet fewer vendors in Mumbwa had completed secondary school than vendors in Cape Town (about 7.5% versus 20%; Battersby et al., 2016). Male vendors having completed more school than female vendors is in line with other findings (e.g., FAO, 2016b).

Vendors have worked in this trade on average for just over six years, with some having begun as recently as in the weeks prior to our fieldwork and others having worked for as many as 32 years. We did not ask whether vendors were migrants. Vendors work on average between six and seven days a week, with most working every day and only a few working as little as two days a week. Vendors spent on average about a half hour walking to reach a given food supplier, although 22.6% of vendors participate in group purchases of food suppliers.

For the majority of vendors, this work is their livelihood. For just over 75% of vendors, selling food is the only source of income for their household, and nearly 90% of vendors see this job as a permanent occupation, rather than a temporary survival strategy. Just over 17% of vendors have paid employees, 8.5% pay to use the space from which they sell food, and almost two-thirds (64.5%) have always sold from the same location. Most vendors choose their location out of convenience, as opposed to making the decision with respect to business opportunities or to escape threat of harassment.

Vendors also face business challenges. Half the vendors stated that, if needed, they would not be able to secure a loan of as little as 250 kwacha (about $19 at the time of the survey). Twenty-nine percent had experienced forced suspension or relocation of their business, the majority of those (73.8%) having been told that it was due to concerns about cholera outbreaks. Vendors reported having been removed by the local council, and in one instance a vendor cited soldiers having been involved. About 43% of vendors who had been removed said that they "never really stopped selling" or that they were "still being chased." But for vendors who did stop selling, their businesses were closed on average for about 7.5 months, with a range of two weeks to as long as two years. As for perceived barriers to business, the majority of vendors were concerned about the volume of business in terms of having enough customers, rather than pricing and competition, which were much less of a concern for vendors (Fig. 2). Other responses included high costs for renting selling space or transport of goods, suppliers being too far away, and unpredictability of income.

4.2. Vendors' instrumental support for the business

Overall, vendors named on average 2.56 network members, that is, those individuals or businesses that they leverage to support their enterprises. Vendors had on average 1.4 suppliers, and while 31% of vendors named no sources of support other than their suppliers, other vendors named up to six network members. In addition to supplier links, we asked about four specific categories of support: financial support to start or currently support the business, help reestablishing the business after forced removal, and other unpaid types of support. Family serve as sources of support in each of these ways, most often by financial support and other unpaid support. But vendors also forge ties with formal and informal banking institutions and other institutions like NGOs. Friends and other vendors also provide unpaid help to vendors, mainly by selling for a vendor or watching their location when the vendor has to be away, or helping to set up the location for business. Notably, no vendors have helpers who keep them informed of rules or regulations that pertain to their business in the city, and very few vendors report having help getting reestablished in business after being removed. This latter statistic is due at least in part to the high number of vendors who, as noted above, stated that they "never really stopped" selling, that is, they continued to sell and to be chased by local authorities. And if authorities do not confiscate or destroy vendors' wares or infrastructure, vendors would be less likely to need help reestablishing their businesses. Fig. 3 shows the proportion of vendors who leveraged linkages for each type of support, and what kind of person or institution provided that support.[5]

4.3. Vendor-supplier relationships

One hundred and forty-six vendors mentioned 204 suppliers that they use to source the five staples in question. Vendors on average named more suppliers than other sources of support for their business. A number of vendors mentioned the same suppliers, such as the central market in town and certain businesses and wholesalers. Many vendors used multiple suppliers, while a handful sourced only from one supplier unique to them. Fig. 4 shows the categories of suppliers categorized into broad groups and the usage of each by vendors.

When asked why vendors used each of their suppliers, vendors often noted that it was because the supplier was near their home (which was often their selling location) or was otherwise conveniently located. Cost was an additional important consideration, but vendors consider a range of reasons for choosing suppliers, such as quality of produce, or that the supplier brings the goods to them - another aspect of convenience for vendors. Additional reasons generated by vendors included security for customers at the supplier, or the ability to be particular in choice (e.g., could choose the size of tomatoes they wanted). We note that no vendors cited an ability to purchase on credit from a supplier as a reason.

In Fig. 5, we provide a visual representation of the network of all the vendor-supplier relationships. Some nodes represent a more general type of supplier named by vendors, such as the nodes that indicate a general response along the lines of "multiple farmers" (despite asking vendors for specificity in naming suppliers). We show the linkage to each vendor who provided this more generic response, because there are many farmers scattered throughout the area and we have no sense of whether one vendor's farmer suppliers overlap with another's. In contrast to the choice to display multiple nodes to represent multiple farmers, we left a single node type coded to represent multiple wholesalers or shops in town because all shops and wholesalers are centrally located in the business district and we can be sure that there is some degree of overlap among shops and wholesalers used among, though we cannot say for sure how they do overlap. Here we see that the most frequently used supplier is the traditional, open-air market in town, which is the white square node with the most vendor connections to it. There are a number of vendors who use that as their sole supplier, while others use a mix of the market and other suppliers. There are a few other suppliers who are used by multiple vendors, such as local wholesalers and particular farms or gardens. However, there are also a few vendors

[5] The tiny share of vendors who claim that they depended on NGOs to help them reestablish business is most likely due to three factors. First, the NGO community is largely concentrated in Lusaka. Second, it has become more restricted and smaller since the introduction of the Non-Governmental Organization (NGO) Registration Act in 2009; before the Act, more than 10,000 NGOs existed but a decade later, only 550 officially were registered. Third, there are few NGOs that specifically represent the rights of vendors, and those that do are largely advocacy-based with few resources to offer members (Hinfelaar et al., 2020).

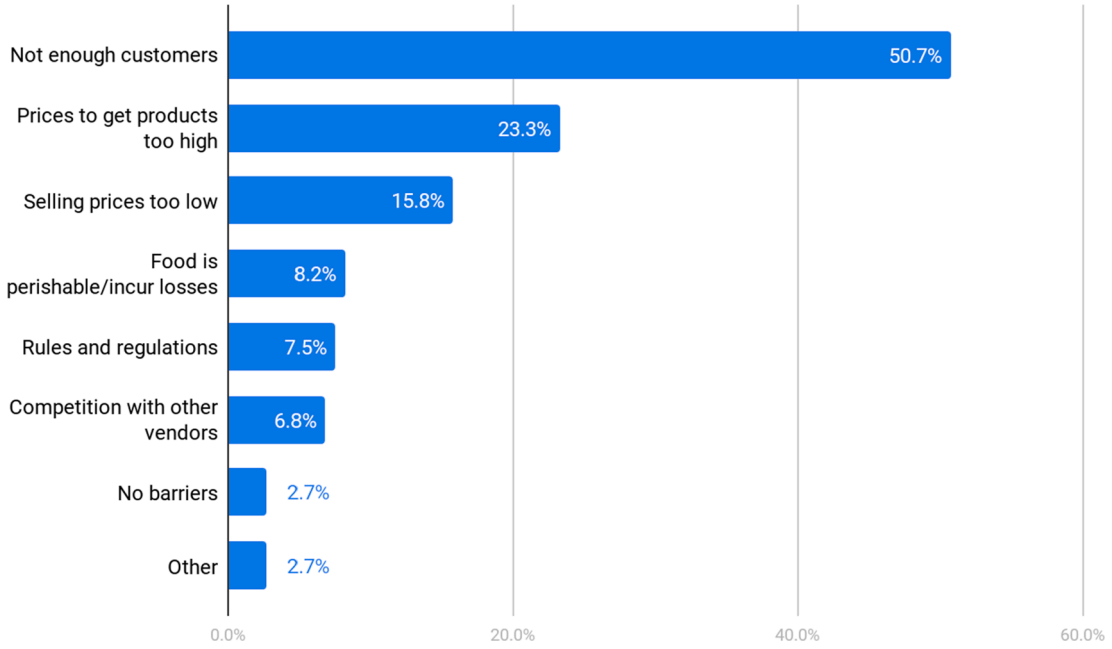

Fig. 2. Main barriers food vendors face.

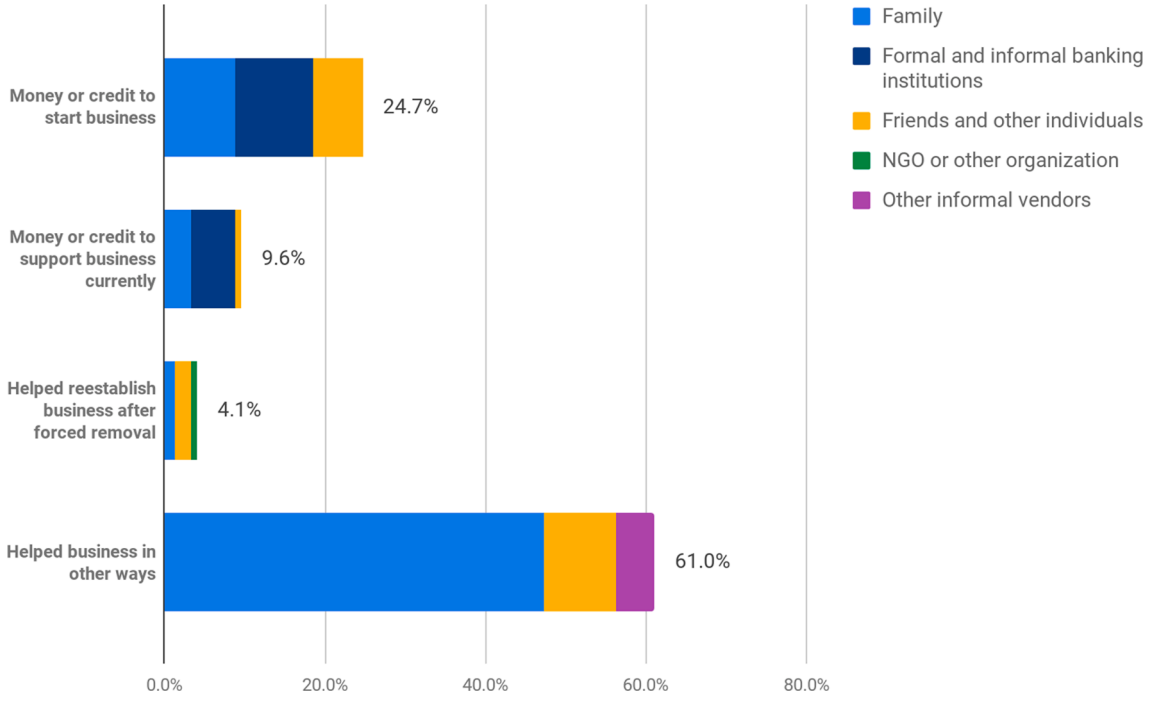

Fig. 3. Proportion of vendors who receive various types of support, and the person or institution providing that support.

who source from unique suppliers who only supply that particular vendor, and some who only sell food that they grow themselves.

4.4. Spatial dynamics of vendors and suppliers

We take a subset of suppliers for whom we were able to capture geographic location (latitude/longitude), and explicitly map those along with vendors' locations to show the extent to which vendors move across the landscape to source their supplies (Fig. 6). While this is only a subset of suppliers, because we were not able to gather GPS locations for all suppliers, it does include the most frequently used supplier, the traditional market, as well as a range of other types of suppliers, including some of the shops or wholesalers and certain gardens or farms. We can see that it is not only vendors who are physically close to the traditional market who use it as a supplier, and some vendors travel a significant distance to source at multiple locations, such as at both the traditional market and another farm or garden.

Given the above figure and the high rate of use of the traditional market as a supplier, we then focus specifically on that market and test whether there are hot (cold) spots in terms of vendor usage of the traditional, open-air market in central Mumbwa. A hot spot of vendors sourcing from the traditional open-air market will feature a cluster of

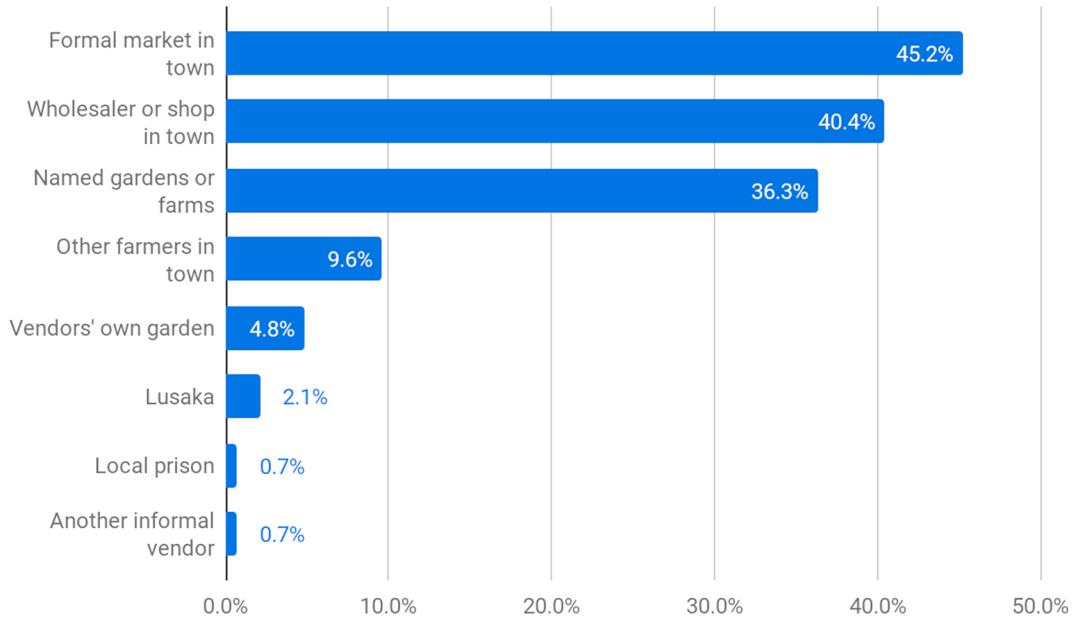

Fig. 4. Types of suppliers used by vendors. Vendors use more than one type of supplier so categories sum to more than 100%. Notes on categories of suppliers: In addition to the main, open-air traditional market, vendors also referred to the old market in town as a supply location ("Formal market in town"). Vendors named specific wholesale or shops in town, or said generally that they sought supplies at shops in town ("Wholesaler or shop in town"). Likewise, vendors sometimes noted farms specifically by name or individuals who owned the farm or garden ("Named gardens or farms"), but other times would only say more generally that they sourced from "multiple farmers in town," without specifically naming any of them ("Other farmers in town").

vendors that source from the market. When the cluster of vendor responses are substantially different from those of the global population, a statistically significant value is observed. This analysis uses Fixed Distance Band to conceptualize the spatial relationship.

To more clearly illustrate our findings, we combine the hot (cold) spots of 95% and 99% into one category: >95%. We find evidence of spatial patterning in vendor usage of certain suppliers in two notable clusters of vendors (Fig. 7). Toward the southwest of Mumbwa, we identify a collection of hot spot values representing 28 vendors that source from the traditional, open-air market in central Mumbwa. To the southeast of the first grouping, we find a grouping of cold spot values. This grouping comprises vendors that source from nearby gardens located to the south and the east of their location (not indicated in the figure). The hot spot is located in a more densely populated area of the city, with little space for growing crops, and this may help explain why the vendors in this area tend to use the main market for the supplier. This is in contrast to the cold spot, which is less densely populated and is near large gardens that vendors can use to source food to sell.

4.5. Spatial dynamics of households

To identify spatial patterns of urban food accessibility, we use the Kulldorff spatial scan statistic to investigate whether there are clusters of households with higher (lower) than average number of visits to informal vendors during a 14-day period. The method uses 999 permutations to identify clusters. Clusters identified by the Kulldorff spatial scan statistic are not found during the same permutation. Each permutation is conducted under a differently sized circular window. Our spatial analysis of household purchasing behavior in Mumbwa indicates one cluster of households reporting statistically significantly higher than average number of visits to informal vendors in a 14-day period ($p < 0.05$; Fig. 8).

The statistically significant cluster comprises 17 households located to the southwest of the geographic center of the city. We find substantial and significant differences between the mean values of multiple household characteristics between households within and outside of the identified cluster (Table 1). On average, in-cluster households consist of 6.1 household members on average, with a dependency ratio of 1.27, which represents 1.27 dependent (below 15 years old or over 65 years old) household members to working age members. Out-cluster households are made up of 5.43 household members, and have a significantly different dependency ratio of 0.96.

Perhaps most important, we find the two clusters have statistically significant differences in their food accessibility, which is an aspect of food security, based on values derived from a simplified version of the Household Food Insecurity Access Scale (HFIAS). The United States Agency for International Development developed HFIAS to quantify experiences related to food inaccessibility by households (Coates et al., 2007). HFIAS is a measure of limited economic accessibility and household consumption, rather than a measure of physical accessibility to food retailers. The metric is a composite score typically comprising nine questions, with each answer having an assigned value based on the severity of the experience. Because the questions pertain to negative outcomes (i.e. lack of food access), lower values represent better food access, while higher values represent poor food access. We opted to use a simplified version of HFIAS with five questions after consultation with local research assistants, who felt a concise battery of questions would provide a more culturally appropriate measure. For this simplified version of HFIAS, values can range from 0 (better food access) to 15 (worse food access). Households inside the cluster have average HFIAS values of 7.7, while households outside the cluster have HFIAS values of 4.5, on average. Substantively, these values indicate households inside the cluster have lower food accessibility compared to households outside of the cluster. Because HFIAS is a way to measure challenges and responses related to food accessibility (limited portion size, skipping meals, etc.), households can both receive a HFIAS score indicating low food accessibility and possess physical access to food suppliers. However, physical access to food suppliers does not mean the households possess the financial resources required to purchase food from those suppliers.

With regard to food accessibility and the local food system, we find households within the identified cluster visit street vendors approximately 11.5 times during a 14-day period, on average. Households outside this cluster visit street vendors significantly less often.

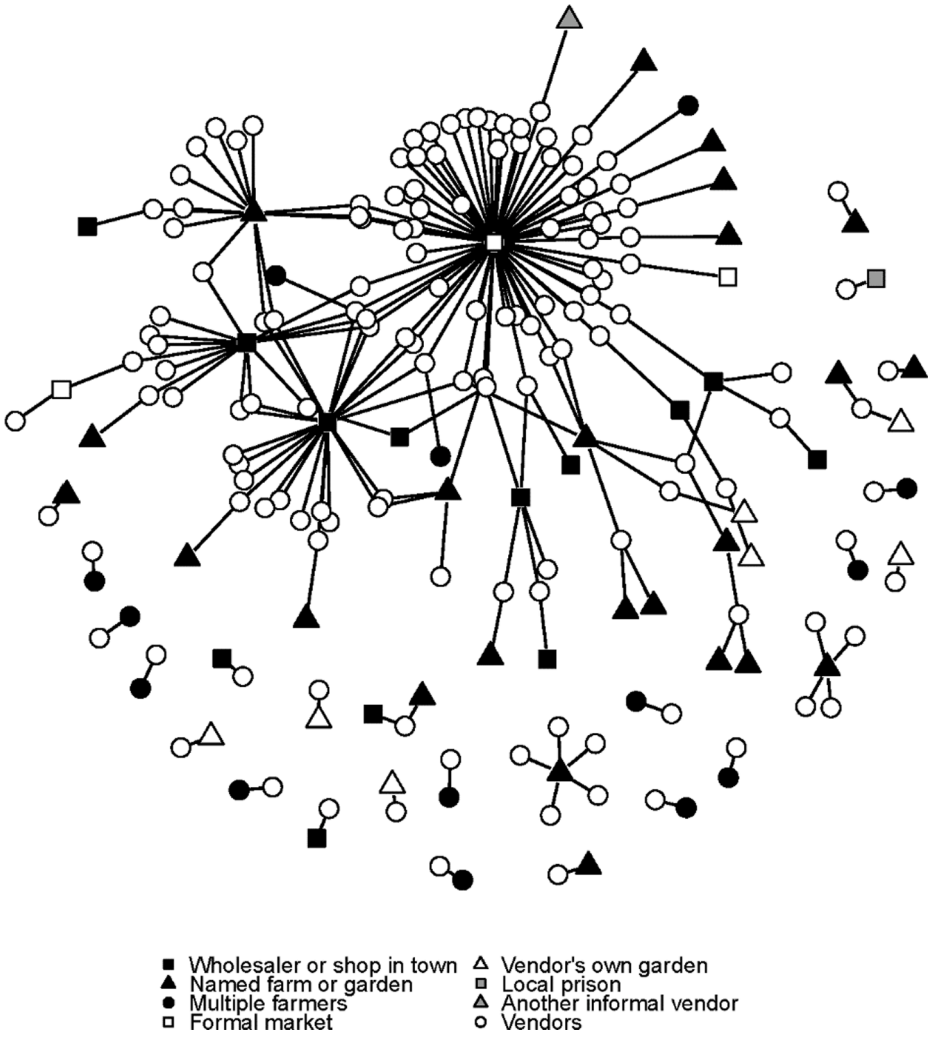

Fig. 5. Vendor and supplier linkages. Nodes are not in any geographic relation to each other in this figure.

Households within the cluster also visit traditional, open-air markets and small grocers significantly more often than households outside of the cluster. On average, in-cluster households visit the market and shops about seven times in the 14-day period, while out of cluster households typically visit the market and small grocers five times during a 14-day period. This suggests that households outside of the cluster have the financial resources to make larger food purchases less often, while households inside the cluster do not have the same resources. As a result, they have to make purchases more frequently to meet their food needs. Households located in the cluster also exhibit different food purchasing behaviors compared to those outside the cluster. Food cost per capita per month is K50 (about $3.80 at time of survey) less for in-cluster households, which also have fewer assets.

Finally, we direct attention to the overlap between the cluster in Fig. 8 and the hot spot in Fig. 7. In this area of the city, residents (Fig. 8) rely on frequent food purchases (often daily or every other day). Vendors that operate there are the primary source for fresh produce (Fig. 7), which is sourced from the traditional market, hence the hot spots representing vendors. In this part of the city, there is no wholesale market, like the one in the city center. Without street vendors operating there, residents would have to travel to the main market. The overlap of these two clusters then also illustrates how vendors are important actors in the food system, particularly in this area, because they offer affordable food options in affordable quantities.

5. Policy implications

Vendors in this emerging city serve as linkages at multiple points in the economic system of the city, but more importantly, they function as key nodes in the food system. Spatial factors related to their role as linking agents are also key for food systems planning. Vendors not only utilize multiple food suppliers for their businesses, but a majority also draw financial and instrumental support from banking institutions (both formal and informal) and other individuals. A proportion of vendors also employ local residents. However, vendors' positions in Mumbwa are tenuous, given the lack of access to loans and legal recognition or protection, including the ever-present possibility for repression. In addition, many vendors are in effect spatially hamstrung: they locate their businesses close to their homes for reasons of convenience and other obligations, yet not having enough customers is the primary problem they face.

As links in the food system, vendors expand the footprint of the urban food system, moving food into residential areas. Food that grows on local farms, or that is brought to the main market for sale, is purchased by vendors who then facilitate outward distribution toward the city's margins. Importantly, vendors serve consumers who may not otherwise be able to travel to the main node of the food system (in many cases the formal open-air market) or to the outer extent of the food system (farmers on the periphery): households' use of informal vendors does exhibit spatial patterning and reflects the spatial context of poverty. Vendors also promote cross-scale linkages from local to global food

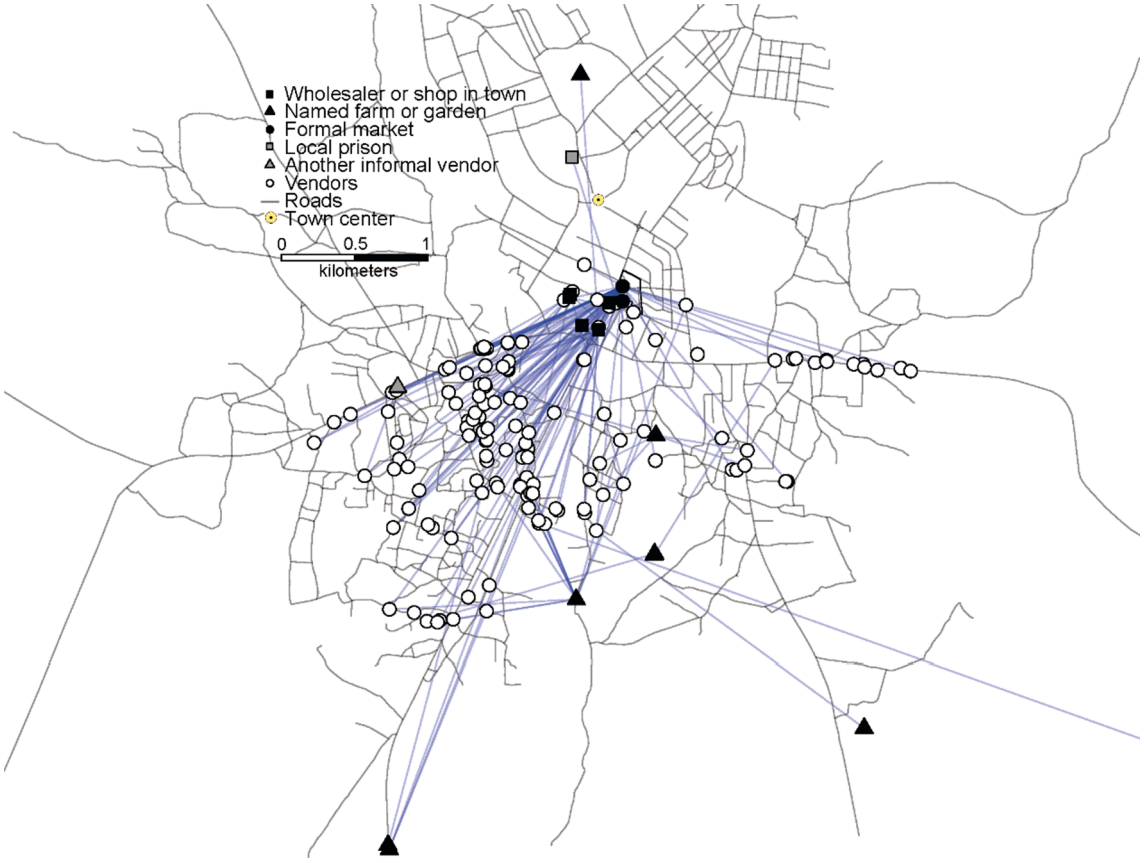

Fig. 6. Vendors' usage of and positions relative to 21 particular suppliers. The line that extends southeast off the map goes to the Soweto Market in Lusaka.

systems. Vendors' ties with farms, the local market, and small shops facilitate food movement at a local to regional scale, while engagement with national chains (e.g., Zambeef) and selling processed food products purchased in stores link to national and global scales.

A significant portion of the food system in growing urban areas in Africa is informal and is integrated with the more formal food system - but not from a policy perspective. Spatial analyses such as those in this paper would not support proposals that, for example, lump informal food vendors in with other informal commodity sellers and place them in a single market location, or take informal food vendors alone as a group and relocate them. Such actions would likely leave many households less food secure, because they ignore the spatial aspects of food distribution and access, removing important nodes that are heavily relied upon by low-income and less food secure households.

Secondary and smaller cities in particular can take advantage of planning opportunities for urbanization and urban food system governance, which can in turn bolster efforts toward inclusive growth and poverty reduction. For example, smaller cities have more possible entry points to plan for infrastructure, and they may serve as first stops for rural, often poorer, migrants, providing pathways out of rural poverty (Christiaensen et al., 2013; Richards et al., 2016; Shifa and Borel-Saladin, 2018). Such cities should not look to larger primary cities as models in planning because the nature of the issues they face, in conjunction with their levels of urbanization and growth, are different. Creating appropriate food systems for secondary and smaller cities will likely require flexible planning, utilizing context-specific approaches that are multi-faceted. While informal vendors can be well networked, for many, the business model remains one of convenience, and there is a lack of robust markets required to sustain them all. More direct involvement of informal vendors in planning will be difficult, yet would help to improve efficiency in terms of the number and spatial distribution of sellers and help develop a food system that is more amenable to growth. For vendors in particular, local government approaches to organize or regulate vendors may be more effective if targeted at groups of vendors, rather than a one-size fits all, food system-wide approach. For example, in Liberia, street traders organized to negotiate a Memorandum of Understanding with the mayor of the capital city of Monrovia in 2018, which intends to regularize street vending and allow traders to operate in certain parts of the city without harassment if the traders adhere to a set of stipulations. There are strict penalties if either side reneges on the agreement, and both the traders and the mayor are required to meet monthly to ensure an open dialogue about any challenges or unforeseen issues (Reed and Bird, 2019). While government officials in Mumbwa must adhere to laws around street vending, there could be room for such local negotiations among parties at the city level.

Assessing and working with spatial aspects of food distribution and access could help ensure economic viability of vendors' and suppliers' livelihoods and help ensure access to food by the poorest households. Where cities are able, they might take advantage of the social and economic web already constructed by informal vendors and consumers as a way to think about integrated growth planning and citizen provisioning. They might take advantage of these linkages and the market opportunities that will come with increased urbanization to help harness the power that local farmers, vendors, small shops, and markets have to work together to create a food system that benefits all these micro- and smaller enterprises while ensuring food security for households. When supermarkets enter local food systems, so much of this power is lost (Steel, 2012). For example, researchers have documented how poorly supermarkets tend to integrate local farmers into their supply chains (Battersby et al., 2016; Michelson, 2013), and there is evidence that supermarkets in other urban contexts in SSA are not improving food security as some have promised (Skinner and Haysom, 2016). This is not to say that a purely local food system is a good goal for cities in SSA (Born and Purcell, 2006), or that the networks of informal vendors will

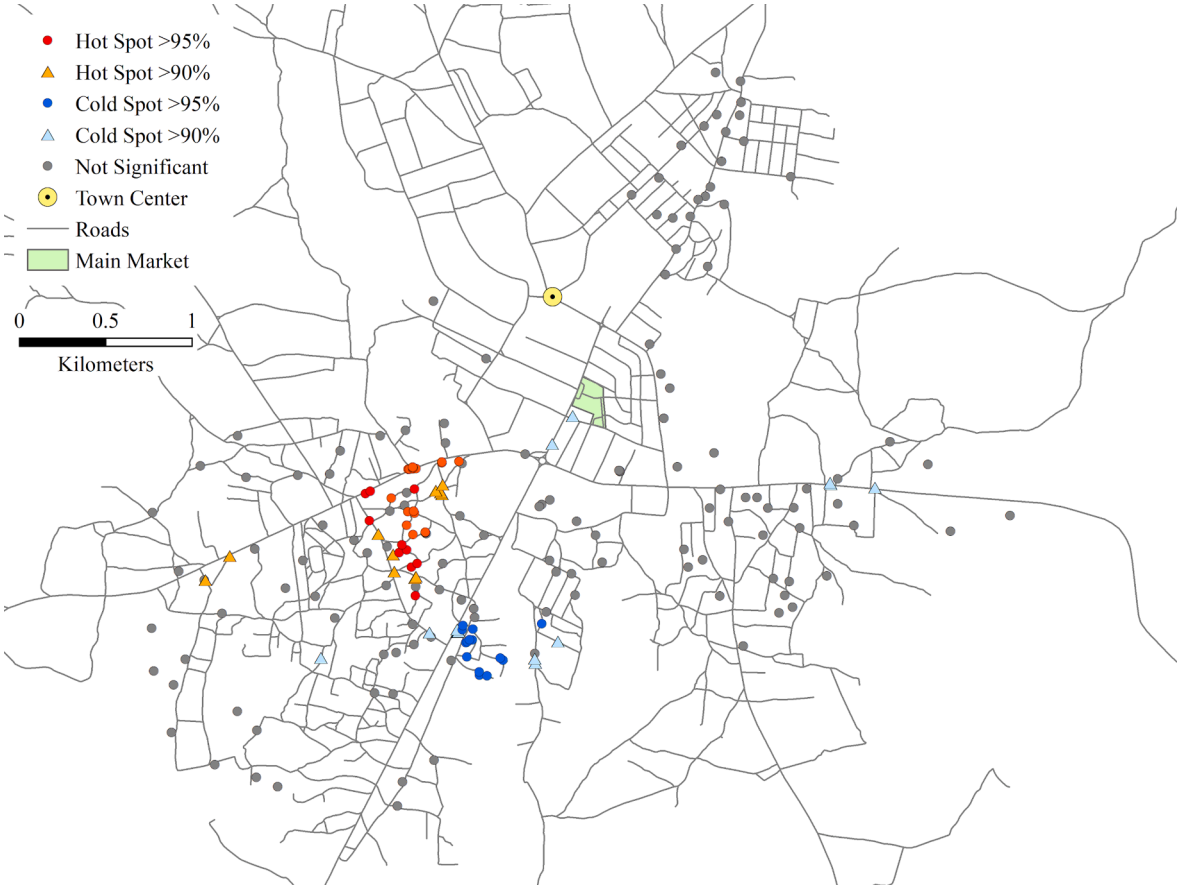

Fig. 7. Distribution of hot (cold) spots of street vendors that source from the main market in Mumbwa, Zambia.

be the main driver in developing sustainable food systems (Meagher, 2005, 2006). But smaller cities in SSA have assets at hand, and many are already doing some of the things advocated by the emerging new food geography, such as fostering shorter supply chains and a diversified food supply (Viljoen and Wiskerke, 2012), both of which are facilitated by informal vendors. With appropriate support from state institutions, these cities can leverage informal vendors to help forge and strengthen links within the food system at multiple levels, setting cities up to create the food systems they want and engage with the global system of food production, distribution, and consumption on their own terms.

Making any of these planning options more viable requires redressing existing policymaking biases towards informal food vendors in Zambia and elsewhere in SSA. First, vendors tend to lack an institutional partner with whom to negotiate their rights and responsibilities, face confusing regulatory environments, and are often used as political pawns in election years. For instance, in 1992, the Statutory Instrument No. 134, known as the Local Government Street Vending and Nuisances Regulations, stipulated that it was illegal to sell produce in any place other than a designated market and to purchase food from street vendors (Munkoyo, 2015). In 2007, as part of the then-government's "Keep Zambia Clean and Healthy" campaign, the Ministry of Local Government amended these regulations (Street Vending and Nuisances Act Amendment of 2007) to increase fines for those trading in unauthorized places (GRZ, 2007). In the wake of a cholera outbreak in 2018 that was traced to informal food retailers, the government also issued Statutory Instrument No. 10, which updated the fines for contravening any of 55 potential restrictions, including working as a hawker in the same area for more than five days in a calendar month, selling food in any street or public place besides a market, and failing to provide adequate clean and safe water on one's business premises (GRZ, 2018). These instruments are in addition to regulations around public health and foodstuffs described earlier in the paper. Such patchworks of regulations around street food vending have been noted in other countries in SSA, such as Ghana (FAO, 2016a).

Second, a common policy employed to deal with vendors is to either relocate them in established markets away from congested streets and central business districts or designate certain streets in which they may operate (Skinner and Haysom, 2016). When not designed with the input of vendors, examples from around the Global South illustrate how these policies often fail because vendors revert back to the streets to find customers or to be closer to suppliers (e.g. Anjara, 2016; Bhowmik, 2010; Steel et al., 2014). A more sophisticated understanding of how space and location affects food access and business networks, such as that provided in this paper, is therefore needed by local governments and urban planners before embarking on such campaigns.

Finally, informal vendors are often treated by policymakers as a liability, but they can play a crucial role in the food system in times of crises. During the COVID-19 pandemic, many vendors, including those in Zambia, were initially cleared from the street and forced to shut down. This is problematic because for many vendors this is their only livelihood and for many consumers, particularly the most food insecure, this is their only source of food. This is also unfortunate since vendors can play a role in moving food around the city safely in the context of a pandemic: because of the extent of their spatial footprint, vendors are able to transport food to peri-urban areas without contributing to dense consumer interaction. Notwithstanding the complexity of land use and property rights laws in urban Africa, it would be useful to have a food distribution system that is set up to serve a broad range of citizens in a city, and is spatially dispersed so that there are few or no retail nodes that become overwhelmed (Institute for Poverty, Land and Agrarian Studies, 2020). That means leveraging and supporting informal food vendors and viewing them as a means for improving food access and

Fig. 8. Cluster identification of households that purchase significantly more time during a 14-day period from informal vendors.

Table 1
Comparison of descriptive statistics of in-cluster and out-cluster households.

	Households inside cluster (N = 17)		Households outside cluster (N = 119)		Statistical significance of difference between means
Variable	Mean	SD	Mean	SD	
HFIAS (0 = better food access)	7.7	2.6	4.5	3.7	***
Assets	0.9	0.7	1.6	1.7	
Household Members	6.1	2.5	5.4	2.4	
Dependency Ratio	1.3	0.9	1.0	0.8	*
Food Expenditures per Capita per Month (Zambian Kwacha)	158.3	136.1	208.3	169.8	
Number of times in the past 14 days the household purchased from a roadside food retailer	11.6	4.7	5.0	5.4	***
Number of times in the past 14 days the household purchased from an open-air market	7.8	5.7	5.2	4.9	**
Number of times in the past 14 days the household purchased from a small grocer	7.3	5.7	4.7	4.6	**

* <0.1.
** <0.05.
*** <0.01.

food systems across scales.

6. Conclusion

Small scale vendors are crucial cogs in local to global food systems in emerging African cities, facilitating cross-scale food transfers. They expand the existing footprint of the food system to peri-urban households and poorer households who are forced to purchase food frequently and in small quantities. Vendors are heterogeneous in terms of their spatial dispersion and business models, selling a range of products, sourcing from varying locations, and serving different types of consumers. They are often treated as a monolith and ignored in the policy making process, despite the valuable role they play in the food system. They provide complementary services to the emerging supermarket trends across SSA and elsewhere, and should be viewed as assets rather than hindrances to food security.

CRediT authorship contribution statement

Stacey Giroux: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing, Visualization, Project administration, Funding acquisition. **Jordan Blekking:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing, Visualization, Project administration. **Kurt Waldman:** Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing, Funding acquisition. **Danielle Resnick:** Writing - original draft, Writing - review & editing. **Daniel Fobi:** Formal analysis, Writing - original draft, Visualization.

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