



Appreciating the Resilience and Stability Found in Heterogeneity: A South African Perspective on Urban Household Food Security

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Urban food security has long been viewed as secondary to rural food security in Africa, and with the migration of large numbers of individuals from rural to urban settings, it has become crucial to place more focus on urban food security. More so, in Southern African peri-urban areas, where high unemployment rates amongst the youth exist. Often, the interventions toward reducing food insecurity in urban settings are taken from those previously designed for application in the rural context. In this study, we aimed to measure the status of food security and identify the factors driving and constraining household food security amongst peri-urban households in Tembisa, South Africa, with the purpose of gaining an in depth understanding of the drivers of urban food insecurity within peri-urban communities. In order to accomplish this, FANTA's Household Food Insecurity Access Scale (HFAS), which measures levels of food security and the Household Dietary Diversity Scale (HDDS), which measures the level of nutritional intake of households was applied. Food prices of the formal and informal markets were monitored over a period of 6 months. A significant decline in household food access over a 4-year period (2013–2016) was observed in addition to low-quality diets. The most commonly used coping methods during periods of low income included borrowing either money or food from friends and neighbors, this was done in conjunction with various other coping strategies. Much of the declining food access was attributed to the inflation of food prices, the lack of employment, lack of formal employment and a high number of household members to breadwinner ratios. High reliance solely on financial capital remains a limitation to the livelihood of urban households. Informal markets are an imperative driver of food security in these peri-urban communities and provide improved food price stability, temporal, and geographical food access through less volatile food pricing, compared to formal markets. Furthermore, government initiatives such as social grants and school feeding schemes have proven to be critical in reducing the vulnerability to food insecurity of most households.

Keywords: food security, urban, rural, informal markets, formal markets, food price hikes, dietary diversity, food access

INTRODUCTION

With a commitment to achieving the Sustainable Development Goals (SDG), one must ask: “Is zero hunger achievable within the next decade?” Even more so in Africa, where food insecurity is undoubtedly a challenge and remains a hindrance to healthy and productive societies. Although some may look to Africa as the world’s future breadbasket, more than 25% of the population is severely food insecure (United Nations Human Settlements Programme, 2018; FAO, IFAD, UNICEF, WFP, and WHO, 2021). There have been ample policy initiatives driving the food security conversation, however, these have often not considered what some refer to as the “looming urban food security crisis” or the “invisible crisis” (Crush and Frayne, 2010; United Nations Human Settlements Programme, 2018), commonly referred to as urban food security.

With Africa’s population rapidly urbanizing at a faster rate than the rest of the world, even exceeding previous projections, urban food security will need to become an even more urgent priority when framing food security policy. Between 2015 and 2021, the urban population grew by more than 397 million people, with more than 90% of the growth coming from developing regions (Pörtner et al., 2022). The literature has highlighted that food security policies in Africa, are disproportionately biased toward rural dwellers (Battersby and Watson, 2018; Crush and Young, 2019; Berlie, 2020; Jonah and May, 2020; Moseley and Battersby, 2020). In light of the rural bias, food security is often addressed as a matter of availability rather than access. Thus, calls for increased agricultural productivity have been central to food security policy (Owoo, 2021). Unfortunately, urban households are often net consumers and rely heavily on the markets to access food. Several studies highlighting the prevalence and severity of food insecurity amongst urban households have been important in driving the increased interest in urban household food security. One such study showed that although many food-insecure households were observed amongst rural households, urban and peri-urban households experienced an increased severity of food insecurity. In 2012, Crush found that of the 11 Southern African cities represented in his study, eight cities had severe food insecurity levels of over 60% (Crush et al., 2012). To experience severe food insecurity an individual or household must have cut back on meal size or frequency often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or spending a whole day and night without eating) unwillingly, and over 60% of households in 8 Southern African cities had resorted to the above coping strategies (Coates et al., 2007 and Crush et al., 2012). Chileshe (2013) documented 90% of the households in Lusaka’s informal areas were food insecure. Studies conducted in Addis Ababa, further highlight the prevalence of urban household food insecurity (74.9%), significantly exceeding national household food insecurity (35%) in Ethiopia (Birhane et al., 2014). In 2019, Stats SA reported that of the 1.6 million food-insecure households reported in South Africa, over 60% were in urban areas. The above stats do not only highlight the prevalence of food insecurity within urban Southern African communities but also emphasize the need for the development

of policies that drive targeted solutions to address this “looming crisis”. However, to develop these targeted policies, one must first understand the underlying issues driving food insecurity within urban and peri-urban communities, their associations and pathways.

Contrary to their rural counterparts, urban and peri-urban dwellers tend to have fewer diverse coping mechanisms. Where rural households make use of diverse streams of capital (social, natural, financial, and human) urban households tend to have limitations in accessing these due to cultural and/or changed social circumstances. The majority of vulnerable urban communities reside on the periphery of cities, with limited access to land and natural resources. Due to similar and limited livelihood strategies with neighbors, social capital can often be easily eroded or unavailable. South Africa’s peri-urban areas, otherwise known as Townships, are marked by high levels of unemployment and poverty resulting from past inequalities. Townships are strategically placed on the outskirts of highly developed areas and were not designed to achieve maximum productivity and economic growth.

Informal markets are an imperative driver of food security in these peri-urban communities (De Zeeuw et al., 2011; Peyton et al., 2015). Unlike formal retail outlets, informal retail outlets tend to sell goods to the local community in smaller affordable volumes (Battersby and McLachlan, 2013; Peyton et al., 2015; Tacoli, 2016). Furthermore, informal shopping outlets are often spatially and temporally more accessible to peri-urban households. Markets such as spaza shops operate for longer hours than formal retailers, allow for credit purchases and usually have a comprehensive understanding of the needs of their community.

South African peri-urban and urban landscapes present an informative case to shed light on issues related to urban food security in Southern African cities. The peri-urban landscapes across the country continue to experience high numbers of rural-urban migration, resulting in a phenomenon referred to as the “urbanization of poverty” (Ravallion, 2009). The current South African urban population sits at 67.35% and is set to exceed 70% by 2025 (Crush and Frayne, 2011; United Nations, Department of Economic and Social Affairs, Population Division, 2019). South Africa is food secure at a national level; however, the country is food insecure at a household level (Statistics South Africa, 2019). In Gauteng, a highly urbanized province in South Africa, which hosts Africa’s richest square mile, ~18% of all households go hungry. Furthermore, in 2017, Stats SA reported the highest documented incidences of malnutrition in Gauteng and the second-highest number of households living in poverty in 2014 (Department of Agriculture Forestry Fisheries, 2014; Statistics South Africa, 2016). Urban household food security, though prevalent in Southern African communities, will not be efficiently addressed until we focus on the urban-specific associations and pathways of food insecurity (Jonah and May, 2020). Battersby and Watson (2018) further state that: “food security programming at the global, regional, and national scales continues to be based on a narrow conceptualization of food security that is poorly equipped to address the growing need for urban solutions”. In light of this, this study aimed to measure the status of food security and identify the factors

driving and constraining household food security amongst peri-urban households in Tembisa, South Africa. Although focused on South Africa, the analysis has implications for the rest of Southern Africa.

METHODOLOGY

Study Area

This study was conducted at Tembisa, situated in the Northeast of Ekurhuleni metropolitan municipality in the heartbeat of the Gauteng Province, South Africa (**Figure 1**). Ekurhuleni Metropolitan Municipality hosts a large proportion of seriously hungry urban households; however, at the time of the study, few studies had been conducted to analyze the state and drivers of food insecurity within Tembisa. With a population of over 512,000, Tembisa is the second most populous township in South Africa after Soweto (O'Neill, 2021). Established in 1957, the history of the township stems from the apartheid era when the forcible removal of black South African families from their homes was rife. In addition to existing pressures, Tembisa receives a large influx of the 10 000 new/additional migrants Johannesburg welcomes each month (Statistics South Africa, 2012; United Nations Human Settlements Programme, 2018). Although urban agriculture is often seen as a solution to food insecurity in the township, the soil fertility in Tembisa is low and the costs of inputs are high. A study on a place such as Tembisa presents an opportunity to gather more evidence to build a case for the understanding and prioritization of food security in peri-urban communities.

Data Collection

Temong, Teanong, and Ethafeni, three sub-areas of Tembisa township, were selected for this study. The selected sub-areas needed to be most representative of Tembisa in terms of the economy and educational levels. Selecting the three sub-areas was done in consultation with a representative/town planner from Ekurhuleni Metropolitan Municipality to avoid bias toward highly advantaged or disadvantaged sub-areas.

A semi-structured interview questionnaire was developed in line with the objective of the study, which was to identify the factors driving and constraining food security amongst peri-urban households in Tembisa. The questionnaire was made up of a combination of open and close-ended questions on socio-demographics, shopping practices, long-term food access, coping strategies in light of food shortages should they occur and spending habits. To determine the factors driving food insecurity, we first needed to understand the status of food security in the study area. The Household Food Security Index Access Scale (HFIAS) and the Household Dietary Diversity Scale (HDDS) Index developed by the Food and Nutrition Technical Assistance Program of USAID were used to assess household food security (**Appendix 1**; Swindale and Bilinsky, 2006; Coates et al., 2007).

In addition to considering changes in food security levels over time, the HFIAS enables one to note the different stages households experience before experiencing chronic food insecurity (Castell et al., 2015). This HFIAS is also a good measure of the levels of food security that different households may be experiencing at the same point in time, thus enabling the

proper evaluation of the state of household food security. When compared with other tools (CSI, rCSI, FCS, and HHS) the HFIAS measured more food security-related factors such as stability, quality, quantity and acceptability of food consumed, whereas other tools only measured two of these factors, making the HFIAS a more suitable tool for this study (Maxwell et al., 2013). It was further established that the HFIAS is more informative when used in conjunction with other tools such as the HDDS (Maxwell et al., 2013). After consideration of the above, it was decided that the HFIAS and HDDS would be the most suitable tool for measuring food and nutrition security for this study.

A key component of this study involved understanding the role local markets, both formal and informal, played in urban household food security of the 140 households sampled in Tembisa. The four sampled supermarkets and shops were selected based on the dominance of household preferences, which were determined during the interviews. Additionally, desktop research was conducted to determine the relationship between household food security and economic factors. Food-stuff brands and quantities were determined with the help from a key informant from the study areas. The monitoring of the prices of these foodstuffs were guided by key informants and food price surveys conducted in South Africa, which made use of the similar products (Statistics South Africa, 2013). The price data were collected on a monthly basis from 3 of the most popular supermarkets in the area over a period of 6 months. The popularity of these supermarkets was determined during household interviews where each household was questioned where they shopped for food. In addition to the 3 supermarkets, 12 spaza shops (4 in each site) and one vegetable/fruit (street vendor) market with a series of stalls were used to monitor food prices. Both formal and informal markets were monitored in this study since most participants often made use of one or the other of these to source their food.

Interviews

In-person interviews were conducted between August 15 and September 30, 2016, with 140 willing participants over 18 years of age. To maintain anonymity, each participant was given a number that followed the first three letters that made up the name of their sub-area, e.g., the first participant from Teanong would be referred to as "TEA 1". Snowball sampling (where future interview participants are recruited from the acquaintances of those being currently interviewed) was used as method of securing interviews with Tembisa households. To further understand how and whether food access had changed in the previous 4 years, participants were asked to rate their access to food between 2013 (Past) and 2016 (Present), on a scale of one to three, with one being inadequate and three being adequate. As part of the survey, we asked about wage changes over the past year. This was done to identify any relationships between food security, wage changes, and purchasing power. Understanding that many households obtain food from local supermarkets and spaza shops, we devised an additional questionnaire for the shop owners and managers. This questionnaire aimed at identifying the drivers of food price hikes within their stores. Participants were asked to list coping strategies used to manage during periods of food shortages. The

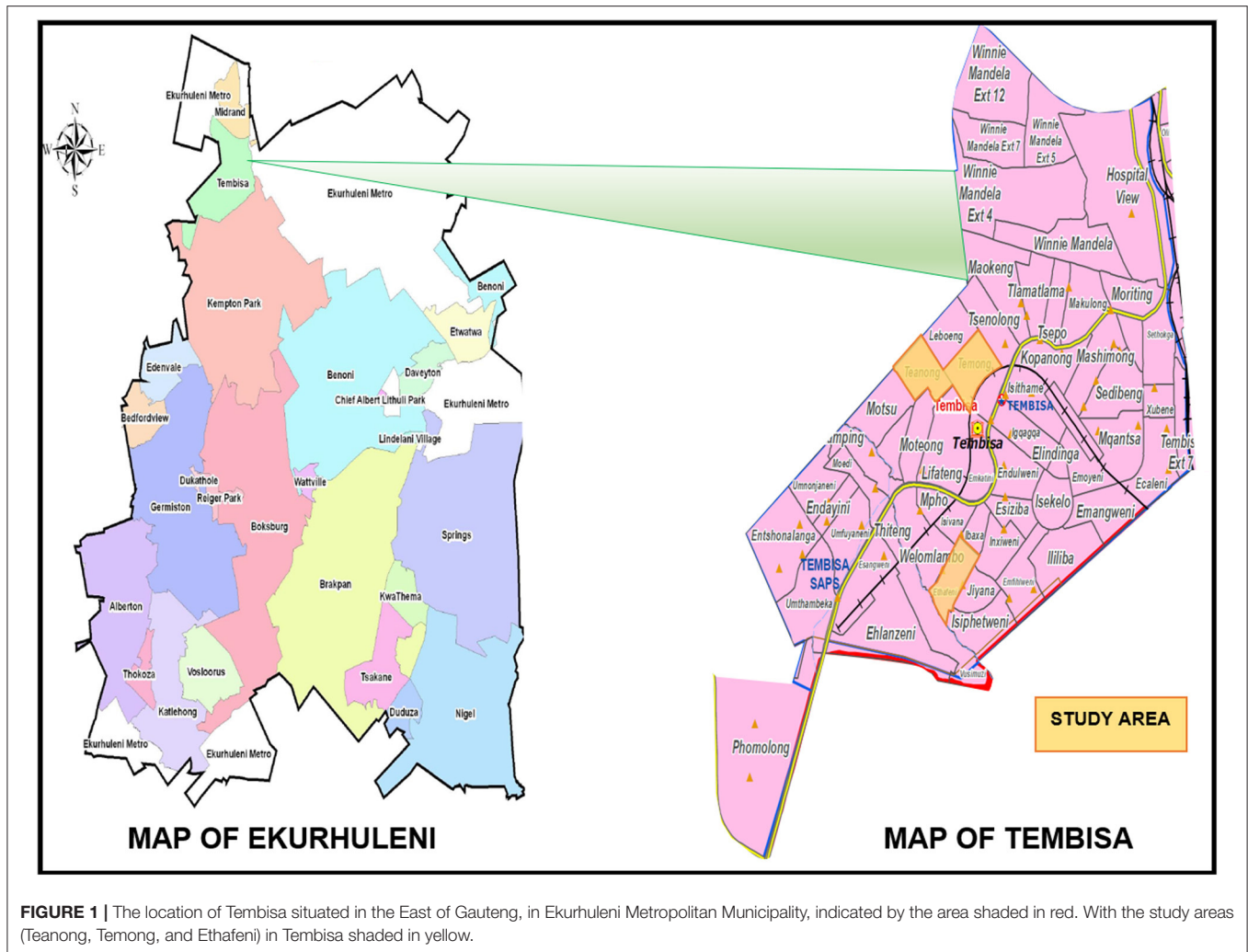


FIGURE 1 | The location of Tembisa situated in the East of Gauteng, in Ekurhuleni Metropolitan Municipality, indicated by the area shaded in red. With the study areas (Teanong, Temong, and Ethafeni) in Tembisa shaded in yellow.

four common strategies were selected to construct the conceptual framework for the study.

Data Analysis

The data were analyzed using Microsoft Excel 2013 and SPSS for Windows version 22 (SPSS Inc., Chicago, Illinois). Descriptive statistics, One-way Anova and Chi-squared tests were used for data analyses.

Using the occurrence of “yes” responses to the Household Food Insecurity Access Score questions, the HFIAS was determined. The following formula was used to determine the Household Dietary Diversity Score:

HHDS
(0–12)

Total number of food groups consumed by members of the household.

Values for A through L will either be “0” or “1”.

Sum (A + B + C + D + E + F + G + H + I + J + K + L).

Making use of 12 food groups, the diversity of household food intake was determined. A score between 0 and 12 was used to determine household dietary diversity where a score of 12 would be the most diverse and 0 represent the lowest diversity. The average household Dietary Diversity Score was determined using the following formulae:

$$\text{Average HHDS} = \frac{\text{Sum (HHDS)}}{\text{Total \# Households}}$$

Descriptive statistics were adopted to determine overall household food security and dietary diversity. Statistical analysis on demographic data were calculated using the Chi-square tests.

Finally, Consumer Price Index (CPI) data were accessed from the Statistics South Africa database and used to map out the relationship between cumulative CPI change and food access between September 2013 and September 2016.

RESULTS

Household Food and Nutrition Security

The data on household food security shows that 76% of the 140 households interviewed were food insecure and of these 31% were severely food insecure. These levels of food security were often accompanied by households/individuals within households skipping meals and reducing nutrient intake. One participant over the age of 50 would simply drink water and go to sleep when he had no food available. An average household dietary diversity score of 4.35 was observed in the households that presented with moderate food insecurity. Half of the severely food insecure households had a dietary score that fell below 4, which is relatively low. A strong association between the HDDS household food security was observed [χ^2 (12, $N = 140$) = 26.594, $P < 0.01$]. A lady who sold¹ *spahlo/kota* for a living recalled eating the same meal throughout the week due to insufficient funds to afford a diverse diet. *Pap* with sour milk or cabbage were amongst foods considered to be default survival food. Another respondent stated that: “we eat to get full, not to enjoy.” Cabbage was often referred to as “poor person’s food.” However, it was an ideal staple for households who could not afford anything else, as one head of cabbage could feed a family of 5 or more. Less than a quarter of the households recalled fruit intake in the past 24h with one respondent saying: “I cannot buy fruit; they are not a priority, because you cannot feed the whole family with fruit.” Whilst another participant implied that fruit were “rich people foods.” Cereals, meat and vegetables, although not diverse, were the most commonly consumed foods.

Characteristics of Food Insecurity

A statistically significant association χ^2 (6, $N = 140$) = 13.135, $p < 0.05$ was observed between food security and the job sector. It was clear that a relationship exists between the job sector that the breadwinner works in and food security, however, this relationship was more visible at certain levels of food security (namely food secure and severely food insecure). Households with formally employed breadwinners had fewer cases of household food insecurity (Table 1). Severe cases of food insecurity were reported by more households with unemployed breadwinners and also households relying on informal income (Table 1).

There was some confusion between employment and unemployment, where most individuals who were earning a living from the informal sector would categorize themselves as “unemployed”, this error was corrected for in the analyses through reclassification of data. Those previously classified as unemployed whilst working in the informal sector were reclassified under the same banner as the informally employed livelihoods. Before the re-classification, more than 50% of the households were classified as unemployed. After re-classification, only 12% of the households constituted of family heads

which were unemployed. In total, 39% of the “employed” households worked in the informal sector and the remainder were formally employed. In South Africa, informal employment sector makes a significant contribution to the economy of the country.

Households where tenants were not renting had more severe cases of food insecurity than household where tenants were renting, when the data were further explored, we found a strong association between household size and renting vs. non-renting tenants χ^2 (6, $N = 140$) = 60.742, $p < 0.001$. On average, renting tenants tended to have fewer household members than non-renting tenants which may explain the higher prevalence of food insecurity amongst non-renting tenants. Older participants in the study (above 40 years) displayed a higher severity of food insecurity than the younger participants (Table 1). The results display an association between the age of the participants and food security χ^2 (9, $N = 140$) = 17.196, $p < 0.05$. Some households relied not only on income from a parent, but also from child grants and grandparent’s pensions. Those receiving grants would be expected to have higher levels of food security because of the additional source of income. However, it is the households’ receiving grants which experienced higher proportions of food insecurity and even more severe levels of food insecurity χ^2 (3, $N = 140$) = 4.321, $p > 0.05$ (Table 1).

Food Security and Market Access

Households were requested to rate their access to food and how it has changed in the past 4 years including the year of the study (2016). The 4-year history was selected because going beyond 4 years may lead to a less vivid recollection food access. The difference between the 4 years was most visible in those experiencing adequate and inadequate levels of food access (Figure 2). There were higher proportions of households with adequate access to food and lower proportions of households experiencing inadequate food access in the first year (2013). However, as the years progressed there was a visible change in those proportions (Figure 2). A number of respondents reported reduced food access over time and attributed this change to their lack of employment due to job losses as well as food price hikes which put strain on breadwinners and their ability to afford basic goods. It is important to note that during the time of the study, a drought ravaged the country resulting in food price hikes.

The difference in the proportions was most visible in the final year (2016), where there were more households experiencing severely inadequate food access [one-sample $t_{(3)} = 4.142$, $p = 0.0247$], than those experiencing adequate food access [one-sample $t_{(3)} = 5.760$, $p = 0.0106$] (Figure 2). We also noted that the change in the number of households stating they had “mildly adequate” food access remained relatively stable throughout the 4 years, when compared to the other states of food access (Figure 2).

Food prices at formal shopping/supermarkets were the most volatile compared to spaza shops, which had consistent prices until March. During March 2017 increases in food prices were observed throughout all spaza shops, and this was said to

¹A meal which comprises of a quarter loaf of white bread, slap chips (oil-soaked deep-fried chips), polony and cheese—depending on how much money a customer is willing to spend—This food is frequently consumed within South African townships and peri-urban spaces.

TABLE 1 | Summary statistics of the relationship between household food security status (based on Household Food Insecurity Access Scale) and demographic data of the study population, using the Chi-square statistical test.

Demographic factors	Category	Level of food security				p-value
		Food secure 24% (n = 33)	Mildly FI 4% (n = 5)	Moderately FI 41% (n = 58)	Severely FI 31% (n = 44)	
Job sector	Formal	30.8	4.6	41.5	23.1	0.041
	Informal	20.7	3.4	44.8	31	
	Unemployed	5.9	0	29.4	64.7	
Gender	Male	28.1	4.7	35.9	31.3	0.519
	Female	19.7	2.6	46.1	31.6	
Rental status	Yes	32.7	1.8	38.2	27.3	0.209
	No	17.7	4.7	43.5	34.1	
Age	18–28	38.6	3.5	36.8	21.1	0.047
	29–39	14	4.6	48.8	32.6	
	40–49	7.1	7.1	42.9	42.9	
	50+	15.4	0	38.5	46.1	
Household size	1–3	27.9	3	41.2	27.9	0.707
	4–6	18.9	5.7	37.7	37.7	
	7+	21.1	0	52.6	26.3	
Government grant	Yes	16.9	3.1	41.5	38.5	0.236
	No	29.3	4	41.3	25.3	
Housing type	RDP	0	11.1	33.3	55.6	0.172
	Shack	0	0	75	25	
	Back room	35.4	2.1	37.5	25	
	House	20.3	3.8	43	32.9	
Duration of stay	1–5	28.6	0	42.8	28.6	0.574
	6–10	30.8	7.7	38.5	23	
	10+	20	4.7	41.2	34.1	
Number of breadwinners	1	22.1	3.2	42.1	32.6	0.632
	2	23.1	5.1	38.5	33.3	
	3	60	0	40	0	
	4+	0	0	100	0	
Total income spent on food	<Than a quarter	50	0	25	25	0.155
	A quarter	30.2	7.6	39.6	22.6	
	Half	11.8	2.9	52.9	32.4	
	> Than half	16.1	0	41.9	41.9	

be associated with the² budget-speech and annual changes in the food basket. Adequate access to food and South Africa's Consumer Price Index (CPI) showed a negative relationship for the 4 years (2013–2016). The CPI increased constantly over the years and as the CPI increased the number of households with adequate access to food had declined (**Figure 2**).

Food prices at formal retail outlets were the most volatile, on the other hand, prices at the spaza shops were the least volatile, with Ethafeni spaza shops experiencing the least food price volatility. Finding a trend in the changes of food prices in major retail outlets was difficult. There were no clear trends noted

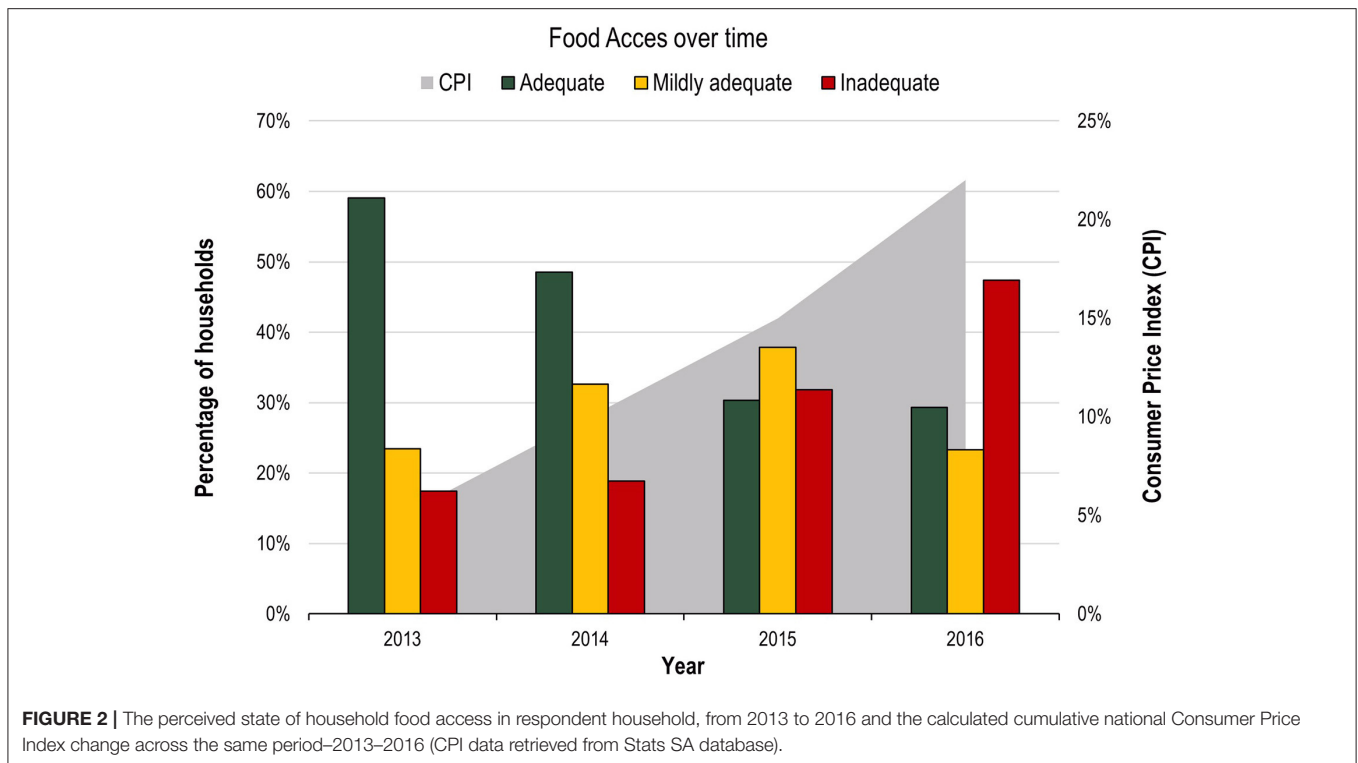
in the 6 months of the study. Prices in retail outlets would rise and fall randomly with no indication of why this may be.

Coping Strategies

Various coping strategies were adopted, where the most common strategies were borrowing money from close friends and family, skipping meals or reducing quality/portions of their food intake “persevering” and taking on³ piece jobs. In terms of “persevering” a respondent stated: “When something is not there, it is not there, you need to accept the situation for what it is.” Borrowing money from friends, neighbors, and colleagues was the most common strategy used by Tembisa residents. Almost half (42%) of the residents made use of this strategy, often coupling it with other

²Annual occurrence in South Africa at the end of February, where the finance minister announces changes in national budget including important tax announcement which have an important bearing on basic food basket pricing.

³Low paying *ad hoc* jobs.



strategies, such as getting money from⁴ *mashonisa* or “Other” unidentified methods. Micro moneylenders in Tembisa, charge a 50% interest on whatever money they loan the residents, usually on a short-term basis. A respondent did however mention that when the *mashonisa* was your friend you could borrow money at a lower (30%) interest rate, which is still high.

DISCUSSION

The South African constitution clearly states that “everyone has the right to have access to sufficient food and water” 27 (1) (b). It further elaborates that “the state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realization of each of these rights.” 27 (2) (The Constitution of the Republic of South Africa, 1996). Three keywords and statements stand out in these sections, “everyone,” “access,” and “progressive realization of these rights.” Historically, South African policy has always been concerned with food security, and regulations and measures have been put in place to ensure that it is addressed. However, food security in South Africa is still viewed as an issue of availability and not of access, thus undermining the needs of the urban poor. This is not unique to South Africa, Berlie (2020) notes that the urban poor in Ethiopia are often overlooked and undermined in research and government actions pertaining to food security. Dake (2021) highlights that even with increased reports of malnutrition in

sub-Saharan Africa, urban food remains marginalized and largely ignored on the global food security and development agenda.

These flaws in food security policy are not those of legal framing. It is because of non-contextualized planning, that urban households continue to be undermined when addressing food security (Battersby et al., 2015). However, food security policy and planning will have to increase their focus on urban household food security as Africa’s population continues to rapidly urbanize.

Drivers of Urban Food Security: Conceptual Framework

Food security is when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life. Only 24% of the 140 households interviewed met this definition. Two factors set food-secure households apart from food-insecure households, formal employment and financial stability resulting in a spend of less than a quarter of their income on food. On the other hand, food price hikes, unemployment, informal employment, and the ratio of breadwinners to household members were the major factors contributing to urban household food insecurity (Figure 3).

In light of these drivers, borrowing money from friends and family was used as a coping strategy (Figure 3). However, this coping strategy became an indirect determinant of food insecurity because, although borrowing money eased hunger in the household in the short term, the long-term repercussions could not be overlooked. Due to similar financial restrictions among friends and family members, and the time frame

⁴Loan shark.

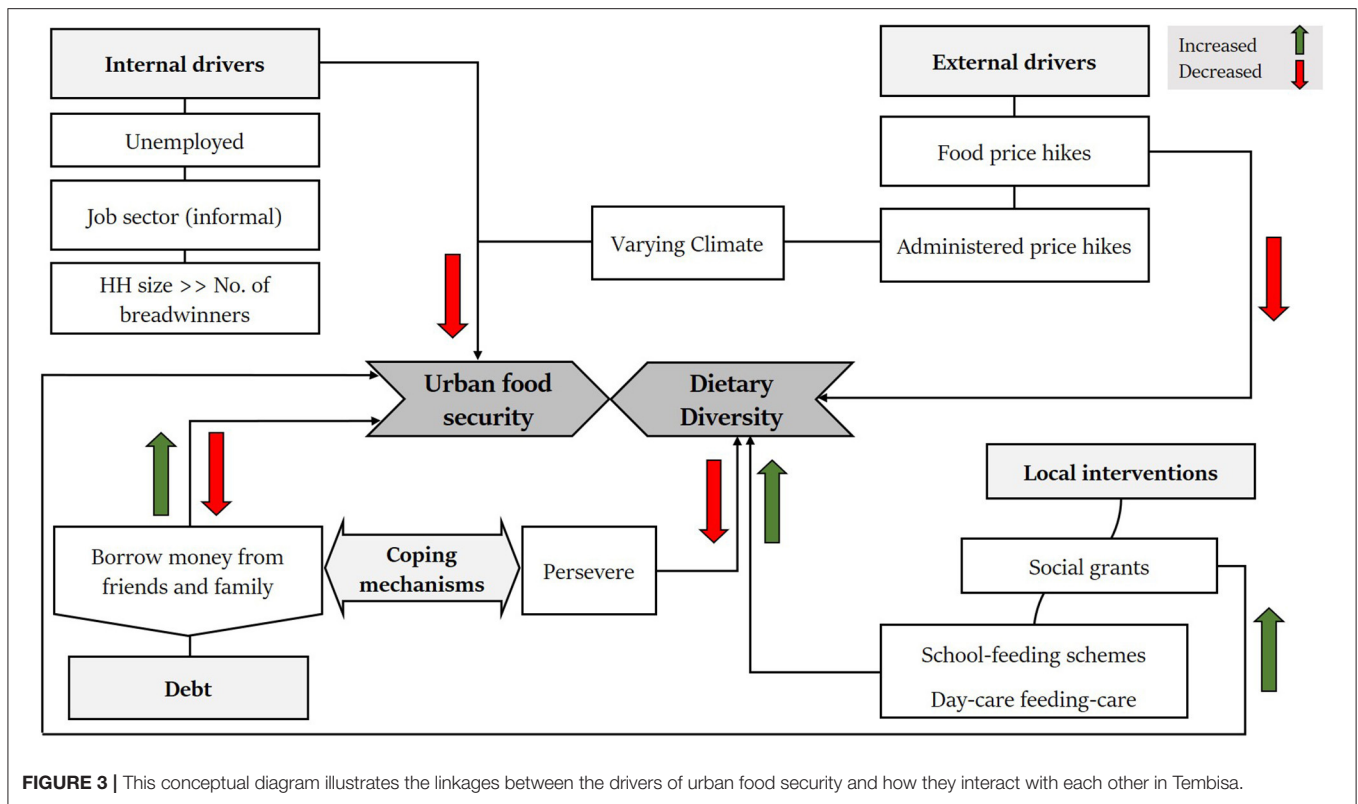


FIGURE 3 | This conceptual diagram illustrates the linkages between the drivers of urban food security and how they interact with each other in Tembisa.

in which one must return the funds, households often find themselves in similar situations where their relief is short-lived. Moreover, many of these households survived off piece jobs and *ad hoc* employment, where funds were sporadically available and could only take care of the household's present-day needs.

In addition to borrowing money, perseverance was used as a coping mechanism. This involved settling for lower quality diets and going hungry in the severest case (Figure 3). Similar strategies were observed amongst urban households in Kenya and Zambia during the global recession of 2008 and 2009 (Hossain et al., 2010). Unfortunately, this had the potential to negatively impact household food and nutrition security, with further impact on the health and vitality of individuals in the household and potential negative implications such as chronic malnutrition, child stunting and cognitive impacts on developing adolescents. These have cascading effects on learning abilities and can reduce the potential of affected individuals to thrive in the educational system.

Through access to social grants, several households received a monthly stipend (32–136\$ monthly) that contributed to food security *via* child grants and older persons' grants (available to unemployed individuals 60 years and older). As expected, households relying on social grant stipends had a pre-disposition to severe food insecurity. Faber et al. (2017) report households receiving social grants were less likely to be food secure and had a low living standard. Nevertheless, these grants acted as a safety net and provided the household with access to markets,

helping reduce the severity of food insecurity experienced by household members.

Another element enhancing food security was the school-feeding scheme offered through the National School Nutrition Program. The program provides two hot meals per day to primary and high school pupils situated in previously disadvantaged communities. The National School Nutrition Program is designed to enhance the pupils' active learning abilities, alleviate short-term hunger, and provide incentives to attend school. Beyond its intended role, the school feeding scheme was instrumental in shielding households from increased food demand during the school term. The absence of the program was even evident during weekends and even more so during school holidays. This is because vulnerable households would struggle to meet their food needs for up to 4 weeks.

Urban agriculture was singled out as a means of enhancing food security within vulnerable urban households, however, there has been limited evidence of its uptake within the studied community. There was only one occasion where a correspondent attributed her household's food security to a vegetable garden run by herself and a few volunteers at the local school. The gardens contribute not only to improved household food security but also to strengthening social cohesion. Urban landscapes and livelihood strategies often suffer from eroded social capital through decreased social cohesion, which negatively impacts the diversity of strategies available to urban households when in need (Harris et al., 2014). Several studies have suggested that urban gardens and agricultural projects indirectly play a role

in strengthening social cohesion amongst urban communities (Harris et al., 2014; Veen et al., 2016; Tornaghi, 2017). Cilliers et al. (2020) further highlights the need for urban planners be more engaged with identification and utilization of urban agriculture as a form of social capital.

Surprisingly, participation in food gardening and urban agricultural initiatives did not resonate well amongst the study cohort. The limited uptake of urban agriculture may be attributed to the age of the participants interviewed, who were mainly 40 years old and younger. Thornton (2008) attributes the limited uptake and negative perception of subsistence farming by the youth to the legacy of apartheid and the homeland system. Whilst lack of capital, the uncertainty of farming, and lack of land are often blamed for the disinterest of youth in agriculture in other parts of Africa (Marson, 2022).

Higher food insecurity rates among homeowners compared to those who rent may be related to their responsibilities and commitments vs. those of tenants. According to Lucci et al. (2018), a lack of accounting for non-food items in urban households, such as housing and payment of other services, that consume a significant share of a homeowner's budget could result in the underestimation of household food insecurity. The additional strain on urban poor households' budgets is likely to increase levels of food insecurity as seen in this study.

Apart from the mortgage payment cost which often surpasses that of the household renting a backroom, those living in their own homes tended to have more household members than those living in back rooms, and therefore, more people to support. This may explain why homeowners—whether RDP or other housing—experienced higher levels of food insecurity. Furthermore, those living in rented out back rooms were mostly youth and young couples, often with fewer responsibilities and financial commitments.

Urban Agriculture

Agricultural programs play an integral role in achieving food security in peri-urban and urban communities and are often cited as the single most effective approach to addressing urban food security. However, to be successful in these already vulnerable landscapes, a lot more consideration needs to be taken into the implementation of urban agriculture-centered projects. Applying urban agricultural concepts in a landscape where the uptake of urban agriculture is already low, one must first address structural limitations. Many of these peri-urban settings are defined by limited spaces, deficient soils and inadequate access to water. Building innovative urban agriculture protocols is the first step. One such solution may be pushing for low irrigation crops, through dry farming—which although it produces a lower yield, can be adequate for subsistence farming. The feasibility of this is yet to be understood. This is because it may have to be applied through vertical farming, while dry farming usually makes use of the below-ground soil moisture. Exploiting coal fly ash as a soil ameliorator could be another way to address the soil moisture and nutrient content limitations.

An annual total of over 30 million tons of coal fly ash are disposed of, in South Africa (Eskom Holdings SOC, 2020). A variety of studies have examined the use of fly ash to modify soil characteristics, including its chemical, physical, and biological

properties (Yunusa et al., 2012; Raj and Mohan, 2014). The ash can be used to improve soil texture, moisture retention and available nutrients (NPK) and has been reported to increase plant growth and crop yields (Yunusa et al., 2012; Raj and Mohan, 2014). The use of such innovations in combination with low-cost methods, such as mulching, could lead to improved urban gardening that requires a low financial input. More specifically, in areas characterized by nutrient-deficient soils. An adequate methodology would have to be developed to prevent phytotoxicity because of heavy metal uptake from the ash to the plant or crop (Gibczyńska et al., 2006). As increased temperatures have been projected for Southern Africa, further research on the performance of fly ash in changing temperatures is needed.

All urban agriculture planning should take futures thinking into consideration. The impact of climate change in cities, through increased drought stress and further exacerbation of this through the heat island effect, should remain central to the development of adequate urban agricultural programs, if they are to be sustainable (Pörtner et al., 2022).

The Informal Economy

Other results highlight the role of formal and informal markets in achieving food security amongst township and peri-urban households. In the current study, the food prices of informal markets were four times less volatile than the prices of formal markets. The combined use of these markets allows for ease of diversification when purchasing food, which is especially relevant where incoming finances are sporadic and inconsistent. Under these circumstances, bulk buying is not possible, and households tend to limit their food quantities based on daily purchases, present needs and available income from the day's earnings. This in itself creates a sense of security for low earning households who have to consider all their needs and have little room to make alternate decisions should food prices change. Thus, many peri-urban communities access food markets through informal markets. Chileshe (2013) found that 91% of peri-urban residence purchased their food from informal markets. Tawodzera and Zanamwe (2016) had similar observations in Harare, Zimbabwe.

Planning around peri-urban areas often revolves around development and ease of access to formal markets. Although critical in increasing job opportunities. The densely populated nature of peri-urban spaces means only a small proportion of households from the population benefit. In some cases, informal vendors are frowned upon or pushed out of the landscape to make way for commercial buildings and supermarkets (Battersby and Watson, 2018). In no way does the above suggest that peri-urban formal market penetration is not beneficial, but it highlights the importance of incorporating informal markets into urban planning strategies. The heterogeneity of formal and informal markets in a given area allows vulnerable households to obtain food with ease. To this point, Davies et al. (2020) highlights the need for urban planners to account for the manner in which urban poor navigate urban food systems in which informal trading, urban agriculture, traditional markets, and modern food retail all play a critical role.

Informal markets are not only key to providing food access, but also assisting in household food stability. Food “stability” is defined as the steadiness of factors that may have an impact on

the availability, access and utilization of food, such as the state of climate change, food prices, politics and economic stability (Food Agriculture Organisation, 2008).

Unemployment Rate

If the 2008–2009 financial crisis, the 2015–2016 drought and COVID-19 have taught us anything, it is the need to build and enact robust and dynamic policies that are beneficial to all. These key periods were accompanied by increased job losses and food price hikes, the two most significant drivers of food insecurity in this study. During the recession, there were up to 800,000 job losses in South Africa alone (Verick, 2012). In Zambia and Kenya, the strain food price inflation placed on households was extreme, and still evident months later (Hossain et al., 2010). COVID alone not only recorded increased cases through job losses, but also loss of income through COVID-related deaths of breadwinners. With its economy having shrunk by an estimated 7%, Southern Africa was the hardest hit by COVID-19, out of the five African sub-regions (Anyanwu and Salami, 2021).

In 2021, South Africa's unemployment rate reached a record high of 35.3% (Statistics South Africa, 2022). These stats were worse amongst individuals without tertiary education and job losses were reported to disproportionately affect this group. Peri-urban landscapes are characterized by low education levels and bear the brunt and increased pressure of high unemployment rates. Several learnership opportunities offered to both matriculated and non-matriculated individuals are made available in South Africa. Many of these include a small stipend and a recognized certificate in the related skill, at the end of the program. These may provide the potential to upskill household members, with the co-benefit of increasing their employability. However, further insights into the drivers of decreased tertiary education in peri-urban areas are needed. These factors all have a bearing on food access and ultimately, food security.

CONCLUSION

At the start of this research, we set out to understand the key drivers of urban household food security in South Africa's peri-urban landscapes. In doing so, we discovered urban resilience and adaptability. Hossain et al. (2010) refers to it as the "undermined resilience". Unlike rural landscapes, that give way to multidimensional livelihood strategies, urban and peri-urban communities rely mainly on the use of one livelihood strategy—financial capital. And so, households in urban landscapes, learn to diversify their approaches to and uses of financial capital, in order to meet their daily needs. This phenomenon is observed throughout the continent. In as much as these strategies contribute to the wellbeing of urban households, many of these households still remain food insecure. How do we then leverage off our understanding of how urban and peri-urban communities operate to enhance the health and vitality of urban communities. More especially in a region, which is urbanizing at a faster rate than any other region in the world?

Studies of this nature should act as a baseline for planning mitigation and adaptation strategies for countries that are soon to have higher urban populations. Especially where migration to urban settings involves, not only the migration of wealth, but

also of vulnerability and poverty into areas already experiencing increasing negative pressures of poverty.

In as much as urban agriculture shows positive impacts in improving household food security, further action is required to build robust, innovative systems to ensure the success of these programs. The cost of participating in these programs should be relatively low and not limited to available land. Furthermore, as the climate becomes increasingly warmer, these strategies will need to incorporate futures thinking in order for them to remain sustainable and feasible under the projected change in climate.

We note that the role of the spaza shop owners, street vendors and informal markets as a whole should not be undermined in such studies, as these stakeholders understand the needs and behaviors of the communities addressed in studies of this nature. Furthermore, the input of informal vendors may prove to be of importance in timely collection of data for the purpose of building sustainable solutions and urban food security policies. We need to enable and facilitate greater partnership between informal players and city planners. It is important to build off community strengths, one such strength being the informal market, which acts as a safety net and is a driver of geographical, temporal and financial food access and stability.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of the Witwatersrand Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Research conceptualization, methodology, formal analysis, funding acquisition, and original draft preparation was done by RN. The editing and supervision were conducted by MS. Both authors have read and agreed to the published version of the manuscript.

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REFERENCES

- Anyanwu, J. C., and Salami, A. O. (2021). The impact of COVID-19 on African economies: An introduction. *Afr. Develop. Rev.* 33, S1–S16. doi: 10.1111/1467-8268.12531
- Battersby, J., Haysom, G., Marshak, M., Kroll, F., and Tawodzera, G. (2015). *Looking Beyond Urban Agriculture: Extending Urban Food Policy Responses*. South African Cities Network.
- Battersby, J., and McLachlan, M. (2013). Urban food insecurity: a neglected public health challenge. *SAMJ South Afr. Med. J.* 103, 716–717. doi: 10.7196/SAMJ.7463
- Battersby, J., and Watson, V. (2018). Addressing food security in African cities. *Nat. Sustainab.* 1, 153–155. doi: 10.1038/s41893-018-0051-y
- Berlie, A. B. (2020). *The Invisible Crisis of Urban Food Security in Amhara Regional State, Ethiopia*. *Journal of Hunger & Environmental Nutrition*. 1–20. doi: 10.1080/19320248.2020.1838983
- Birhane, T., Shiferaw, S., Hagos, S., and Mohindra, K. S. (2014). Urban food insecurity in the context of high food prices: a community based cross sectional study in Addis Ababa, Ethiopia. *BMC Public Health*. 14, 1–8. doi: 10.1186/1471-2458-14-680
- Castell, G. S., Rodrigo, C. P., de la Cruz, J. N., and Bartrina, J. A. (2015). Household food insecurity access scale (HFIAS). *Nutricion hospitalaria*. 31, 272–278. Available online at: https://www.fantaproject.org/sites/default/files/resources/HFIAS_ENG_v3_Aug07.pdf
- Chileshe, B. (2013). *The State of Food Insecurity in Lusaka, Zambia*. Kingston, ON; Cape Town: African Food Security Urban Network: Urban Food Security Series (19).
- Cilliers, E. J., Lategan, L., Cilliers, S. S., and Stander, K. (2020). Reflecting on the potential and limitations of urban agriculture as an urban greening tool in South Africa. *Front. Sustain. Cities* 2, 43. doi: 10.3389/frsc.2020.00043
- Coates, J., Swindale, A., and Bilinsky, P. (2007). *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3*. Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development.
- Crush, J., and Frayne, B. (2010). *The Invisible Crisis: Urban Food Security In Southern Africa*. Cape Town: AFSUN.
- Crush, J., Frayne, B., and Pendleton, W. (2012). The crisis of food insecurity in African cities. *J. Hunger Environ. Nutr.* 7, 271–292. doi: 10.1080/19320248.2012.702448
- Crush, J., and Young, G. (2019). “Resituating Africa’s urban informal food sector,” in *Urban Forum, Vol. 30* (Urecht: Springer), 377–384.
- Crush, J. S., and Frayne, G. B. (2011). Urban food insecurity and the new international food security agenda. *Dev. South. Afr.* 28, 527–544. doi: 10.1080/0376835X.2011.605571
- Dake, F. A. (2021). Foodscapes in urban spaces of Africa: implications for food and nutrition security among the urban poor. *AAS Open Res.* 4, 44. doi: 10.12688/aasopenres.13283.1
- Davies, J., Hannah, C., Guido, Z., Zimmer, A., McCann, L., Battersby, J., et al. (2020). Barriers to urban agriculture in Sub-Saharan Africa. *Food Policy* 103, 101999. doi: 10.1016/j.foodpol.2020.101999
- De Zeeuw, H., Van Veenhuizen, R., and Dubbeling, M. (2011). The role of urban agriculture in building resilient cities in developing countries. *J. Agric. Sci. London* 149, 153. doi: 10.1017/S0021859610001279
- Department of Agriculture Forestry and Fisheries (2014). *National Policy on Food and Nutrition Security*. Government Gazette, Department of Agriculture, Forestry and Fisheries, South Africa. Available online at: <http://www.nda.agric.za/docs/media/NATIONAL%20POLICYon%20food%20and%20nutrition%20security.pdf> (accessed July 01, 2017).
- Eskom Holdings SOC, Ltd. (2020). *Duvha Power Station*. Eskom Heritage. Available online at: <https://www.eskom.co.za/sites/heritage/Pages/Duvha.aspx> (accessed April 03, 2022).
- Faber, M., Wenhold, F. A., and Laurie, S. M. (2017). Dietary diversity and vegetable and fruit consumption of households in a resource-poor peri-urban South African community differ by food security status. *Ecol. Food Nutr.* 56, 62–80. doi: 10.1080/03670244.2016.1261024
- FAO, IFAD, UNICEF, WFP, and WHO (2021). *The State of Food Security and Nutrition in the World 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all*. Rome, FAO. doi: 10.4060/cb4474en
- Food and Agriculture Organisation (2008). *An Introduction to the Basics of Food Security*. Food Security Information for Action. Practical Guides.
- Gibczyńska, M., Meller, E., Stankowski, S., and Wołoszyk, C. (2006). Metal content in soil fertilized with brown coal fly ash. *Agron. Res.* 4, 509–516.
- Harris, N., Minniss, F. R., and Somerset, S. (2014). Refugees connecting with a new country through community food gardening. *Int. J. Environ. Res. Public Health*. 11, 9202–9216. doi: 10.3390/ijerph110909202
- Hossain, N., Fillaili, R., and Lubaale, G. (2010). Invisible impacts and lost opportunities: evidence of the global recession in developing countries. *J. Pover. Soc. Justice* 18, 269–279. doi: 10.1332/175982710X530561
- Jonah, C. M., and May, J. D. (2020). The nexus between urbanization and food insecurity in South Africa: does the type of dwelling matter? *Int. J. Urban Sustain. Dev.* 12, 1–13. doi: 10.1080/19463138.2019.1666852
- Lucci, P., Bhatkal, T., and Khan, A. (2018). Are we underestimating urban poverty? *World Dev.* 103, 297–310. doi: 10.1016/j.worlddev.2017.10.022
- Marson, M. (2022). *The Future of African Agriculture: Challenges and Opportunities for the Youth*. In *Interdisciplinary Approaches to the Future of Africa and Policy Development*. IGI Global, 302–315.
- Maxwell, D., Coates, J., and Vaitla, B. (2013). *How do Different Indicators of Household Food Security Compare? Empirical Evidence from Tigray*. Medford: Tufts University. p. 26.
- Moseley, W. G., and Battersby, J. (2020). The vulnerability and resilience of african food systems, food security, and nutrition in the context of the COVID-19 pandemic. *Afr. Stud. Rev.* 63, 449–461. doi: 10.1017/asr.2020.72
- O’Neill, A. (2021). *South Africa: Urbanization from 2010 to 2020*. Statista. Available online at: <https://www.statista.com/statistics/455931/urbanization-in-south-africa/> (accessed April 3, 2022).
- Owoo, N. S. (2021). Demographic considerations and food security in Nigeria. *J. Soc. Econ. Dev.* 23, 128–167. doi: 10.1007/s40847-020-00116-y
- Peyton, S., Moseley, W., and Battersby, J. (2015). Implications of supermarket expansion on urban food security in Cape Town, South Africa. *Afr. Geogr. Rev.* 34, 36–54. doi: 10.1080/19376812.2014.1003307
- Pörtner, H.-O., Roberts, D. C., Adams, H., Adelekan, I., Adler, C., Adrian, R., et al. (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Urecht: IPCC. Available online at: <https://edepot.wur.nl/565644>
- Raj, S., and Mohan, S. (2014). Approach for improved plant growth using fly ash amended soil. *Int. J. Emerg. Technol. Adv. Res.* 4, 709–715.
- Ravallion, M. (2009). How relevant is targeting to the success of an antipoverty program?. *The World Bank Research Observer*. 24, 205–231.
- Statistics South Africa (2012). *GHS Series. Food Security and Agriculture 2002-2011: In-Depth Analysis of the General Household Survey data Volume IV*. Pretoria, South Africa.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2022.721849/full#supplementary-material>

- Statistics South Africa (2013). *Consumer Price Index. Statistical release: P0141*. Pretoria, South Africa.
- Statistics South Africa (2016). *Taking Stock of Food Prices*. Statistics South Africa, South Africa. <https://www.statssa.gov.za/?p=6421> (accessed January 26, 2017).
- Statistics South Africa (2019). *Towards Measuring The Extent of Food Security In South Africa: An Examination of Hunger and Food Inadequacy. Report: 03-00-14 Pretoria*. Statistics South Africa.
- Statistics South Africa (2022). *Quarterly Labour Force Survey (QLFS) - Q4:2021*. Available online at: <http://www.statssa.gov.za/publications/P0211/Media%20release%20QLFS%20Q4%202021.pdf> (accessed April 03, 2022).
- Swindale, A., and Bilinsky, P. (2006). *Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (v.2)*. Washington, DC: FHI 360/FANTA.
- Tacoli, C. (2016). *Informal Food Systems and Food Security in Rural and Urban East Africa*. London: International Institute for Environment and Development.
- Tawodzera, G., and Zanamwe, L. (2016). *The State of Food Insecurity in Harare, Zimbabwe (No. 13)*. Southern African Migration Programme.
- The Constitution of the Republic of South Africa (1996). Section 27 (1) (b) and (2).
- Thornton, A. (2008). "Beyond the metropolis: small town case studies of urban and peri-urban agriculture in South Africa," in *Urban Forum (Vol. 19)*. (Urecht: Springer), 243–262.
- Tornaghi, C. (2017). Urban agriculture in the food-disabling city: (Re) defining urban food justice, reimagining a politics of empowerment. *Antipode* 49, 781–801. doi: 10.1111/anti.12291
- United Nations Human Settlements Programme (2018). *The State of African Cities, 2018: The Geography of African Investment*. United Nations Human Settlements Programme.
- United Nations, Department of Economic and Social Affairs, Population Division (2019). *World Urbanization Prospects 2018: Highlights (ST/ESA/SER.A/421)*. United Nations, New York.
- Veen, E. J., Bock, B. B., Van den Berg, W., Visser, A. J., and Wiskerke, J. S. (2016). Community gardening and social cohesion: different designs, different motivations. *Local Environ.* 21, 1271–1287. doi: 10.1080/13549839.2015.1101433
- Verick, S. (2012). Giving up job search during a recession: the impact of the global financial crisis on the South African labour market. *J. Afr. Econ.* 21, 373–408. doi: 10.1093/jae/ejr047
- Yunusa, I. A., Loganathan, P., Nissanka, S. P., Manoharan, V., Burchett, M. D., Skilbeck, C. G., et al. (2012). Application of coal fly ash in agriculture: a strategic perspective. *Cri. Rev. Environ. Sci. Technol.* 42, 559–600. doi: 10.1080/10643389.2010.520236

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