Full Length Research Paper

Food access and interventions: A case study of the urban poor in Namibia

Larry Williams[1]* and Kelvin Smith[2]

[1,2]School of Animal Plant and Environmental Sciences, University of Witwatersrand Johannesburg, Private Bag 3, WITS 2050, South Africa.

Food security is at the forefront of the global agenda as seen in the newly developed Sustainable Development Goals (SDG's). For much too long the urban crisis of food security has remained in the shadow of rural food insecurity. In southern Africa the majority of food security interventions are focused on the rural poor, but it's been recognized that the urban poor are facing serious challenges with regards to reaching a food secure state. In light of market prices increasing at an alarming rate, the state of the urban poor's ability to access these markets need to be investigated, in order to facilitate problem specific interventions. Household Food Insecurity Access surveys were conducted to assess the state of food security in informal settlements of Windhoek; furthermore dietary diversity and month of adequate food in households were also investigated. It was found that food insecurity is high (>80%) amongst households, dietary diversity low (maize and sugar being the most dominant foods) and coping strategies severe (e.g. fewer meals per day). Furthermore, market access appears to be hindered mainly by lack of finance. Urban interventions were reviewed which showed that context specific interventions are few and mostly unsustainable. This confirms the limited attention the urban poor receive with regards to food security and that much more should be done to improve the situation in order to reduce food insecurity and achieve the Sustainable Development Goals.

Keywords: Urban, food security, market, access, interventions.

INTRODUCTION

Global food security has taken a forefront position in the global agenda, which is evident in the past Millennium Development Goal (MDG's) targets and the Sustainable Development Goals (SDG's) that replaced the MDG's in early 2016; where both focus on improved food and nutritional security, as well as reduced poverty (UN, 2015). Africa in particular is making great strides in reducing food insecurity on the continent as seen initially in the African Union's agenda 2003 and the progress is continuing (AU, 2014). The rapid global population growth, especially in Africa, is the fundamental reason why such great

focus is being placed on improved food and nutritional security. The challenge of climate change is a global phenomenon that threatens millions of livelihoods by affecting agricultural activities, food security, water resources, health, social systems and the functioning of ecosystems (Barroset al. 2014). Over 60% of the population in Sub-Saharan Africa (SSA) lives in rural areas where food access is dependent on subsistence farming (Connolly-Boutin and Smit, 2016). The looming climate change effects will have far more pronounced negative impacts on the livelihoods in this region than the rest of the continent (Kahsayet al. 2017).

The increase of the global population has led to an increase in competition for the world's resources such as land, water and energy; which all influence our ability to produce food. Furthermore, factors such

Corresponding author E-mail: larry_williams@gmail.com

as war, social unrest, gender inequality, poor education, macroeconomic imbalance and poor human resource base, all influence food security (Mwaniki, 2006; Charles et al. 2010; Hendrix and Brinkman, 2013). As a result of all these factors (that are often interrelated and complex) food insecurity has become a challenge many nations face around the world, however, food accessibility appears to be a much larger problem than the availability of food itself (Mwaniki, 2006; Wheeler and von Braun, 2013). It is interesting to note that despite the growth of the human global population over the past few decades, food production (availability) has increased over the last fifty years and this growth in global food production, has seen a reduction in the proportion of people in the world that are hungry (Charles et al. 2010), however malnutrition seems to still be a major concern worldwide (FAO, 2015). Food security is often viewed through two lenses, one urban and the other rural, where the drivers and associated challenges of food security differ within these contexts.

In sub-Sahara Africa food security has long been focused in rural areas despite the fact that the region is rapidly becoming urbanized, with urban poverty on the rise in most countries (FAO, 2015). Limited research has been undertaken in urban areas, few localized studies have been done, for example, in Tshwane, South Africa (Akinboade and Adeyefa, 2018) and Africa-wide studies have been published by Battersby and Watson 2018 and Conolly-Boutin and Smit 2016. Food security in urban areas can be easily overlooked due to how it presents itself, it is important to realize that urban food security is not triggered by absolute food shortages (availability), but by a household's failures to access available food (Maxwell 1999; Battersby 2012). Food insecurity lies mainly in the often marginalized urban poor, the availability of food itself seems to be less of a problem, than household's ability to access markets, a trend observed in other southern African countries (Ziervogel and Frayne 2011; Nickanor 2013). Furthermore, existing perceptions of food security being a rural problem may lead to policy makers overlooking the rising problem of food insecurity in urban areas. Social capital and collective action for the development and implementation of adaptive policies are needed to address impacts of climate change especially in ensuring food security (Adger 2003).

The situational analysis on the state of food insecurity of urban cities in Southern Africa, carried out by the African Food Security Urban Network (AFSUN), has identified Namibia as a country that suffers from high levels of urban food insecurity at the household level (Pendleton et al. 2012). Namibia is an upper middle income country with a population of approximately 2.5 million people (Pendleton et al. 2012; Namibian Statistics Agency (NSA) 2011) and is considered the driest country

south of the Sahara (annual rainfall 25-700 mm) (UNFCCC, 2011; Ministry of Environment and Tourism (MET) 2014). Water is a scarce commodity and is a key limitation in the development of the country (UNFCCC 2011; Kusangaya et al. 2013; Ministry of Agriculture, Water and Fisheries (MAWF) 1997, 2015), thus the country relies heavily on imports to meet its food demand (Whitehouse, 2004). Major foods imported are cereals (maize and wheat), pulses, vegetable oil and dry skimmed milk powder. Changes in the global market in particular has had a major influence on food prices in the country, in 2016 Namibia experienced an increasing trend in the inflation rate of most goods (NSA, 2016). These trends have adverse impacts on household's ability to access food, especially for low income households. Therefore adequate, robust and context specific food interventions play an important role in ensuring food security (Rose, 2008).

Given the limited knowledge on urban food security, interventions may not fully address issues faced by communities, especially vulnerable groups. The focus of this study was twofold, to examine 1) the accessibility aspect of food security in Windhoek's informal settlements and 2) to analyze food interventions in Windhoek, with specific objectives to 1) assess accessibility of informal households to food and the coping mechanisms households employ to deal with possible food shortages and 2) assess physical accessibility to formal markets and to investigate the feasibility of informal markets as an alternative to formal markets and 3) briefly review urban food security interventions by various institutions in Namibia.

MATERIALS AND METHODS

Study site

Windhoek, the capital of Namibia, is one of the fastest growing cities in southern Africa and is home to 36% of the country's urban population (National Planning Commission (NPC) 2012). The country is situated on the Atlantic coast of Southern Africa and its climate is heavily influenced by the cold Benguela current and the tropic of Capricorn (MET 2014). The city is divided into various constituencies that are governed by local authorities. The majority of informal settlements in the city are located in Katutura, the largest township in the city (NSA 2011; Pendleton *et al.* 2012; Nickanor 2013).

Sampling design

Food security assessment

Food security status and coping mechanisms of households were assessed using five questionnaires. These were; 1) The household Food Insecurity and Access

Scale (**HFIAS**), 2) The Household Dietary Diversity Score (**HDDS**), 3) Months of Adequate Household Food Provisioning (MAHFP),(Swindale and Bilinsky 2006; Coates et al. 2007; Bilinsky and Swindale 2010), 4) Coping Strategies and 5) Share of Food on total household expenditure.

The project surveys were conducted at three major informal settlements (located across three constituencies) in and around Windhoek, which are 7/8ste Laan (Khomasdal North), Hakahana (Moses Garoëb constituency) and Okahandja Park (Tobias Hainyeko). Each of these falls within three distinct constituencies in Katutura and Khomasdal North. Forty households were surveyed form 7/8ste Laan, 39 from Havana and 37 from Okahandja Park. Numbers of households were selected based on willingness of households to participate and safe access to communities. The snowball sampling technique was used for household selection (Sadler et al. 2010). Snowball sampling uses a small pool of initial informants to nominate other participants who meet the eligibility criteria for a study. Snowball sampling is a useful way to pursue the goals of purposive sampling in many situations where there are no lists or other obvious sources for locating members of the population of interest, but it does require that the participants are likely to know others who share the characteristics that make them eligible for inclusion in the study, this is often a limitation to this method (Morgan 2012).

Market research

A spatial dataset of markets (grocery stores and mini-markets) was created by collecting physical addresses of 52 full-serviced markets in Windhoek using the local directory and information from the Namibian Statistical Agency (NSA) and addresses were geo-encoded (Laraia et al. 2004; Jiao et al. 2012; Breyer and Voss-Andreae 2013). Markets had to have a minimum of ten fresh items to be included in the analysis. To determine market access, all markets within a 1.61 km of the extensions in which each informal area was located were selected, this value was used as any area beyond that distance is classified as a food desert (Jiao et al. 2012; Breyer and Voss-Andreae 2013). Extension areas in constituencies were used instead of settlement boundaries due to unavailability of settlement data.

Informal market prices were collected for items found on the HDDS food categories. There was some variation due to differences in available stock. The difference for the average price of a basket of food and basket items were compared between informal and formal food markets , to assess the availability of food groups and prices between these markets. To assess adequacy of local markets as an alternative (cheaper and closer) source of food, prices were compared with national food prices were obtained for a basket of food.

Intervention analysis

Interventions, including project management strategies and policy documents, were reviewed by collecting reports related to food security, poverty alleviation, early warning systems, social programmes and micro financing. These reports were collected from government, UN agencies, NGO's, civil organizations and church websites (Agriculture and Development Economics Division (ESA) 2006). Key word criteria were developed to sort projects. Projects were categorized based on the categories developed by Rose (2008).

Data Analysis

Descriptive statistics for the socio-economic factors as well as the food security indices were produced. Differences between levels of household food insecurity between the study sites was tested using ANOVA. Pearson's Chi-squared test of independence was used to test for relationships between HFIAS, HDDS and MAHFP against socio−economic factors (gender, employment, income range, etc. (Swindale and Bilinsky 2006; Coates et al. 2007; Bilinsky and Swindale 2010).The data were collected using a questionnaire that consists of nine questions which measures the occurrence of food (in) security and nine subsequent questions that measure the frequency of occurrence. Frequencies of occurrence questions were followed up with additional questions only when respondents gave affirmative answers to occurrence questions.

All questions in the questionnaire were used to calculate the HFIAS. A HFIA score variable was first calculated by summing the frequency of occurrence score for each household. A household could have a maximum of 27 points (all nine answers had a frequency of "often", which received the code 3) and a minimum of zero (answers for the occurrence was "zero", therefore frequency of occurrence would be zero). After the calculation of the HFIAS score variable, the indicator value was calculated using the sum of all HFIAS score variables. Narrative data analyses were used to describe trends and observations made by households on food security, market access and interventions (Bold 2013). ArcGIS was used to analyse market distance to settlements.

RESULTS

Household heads, household size, employment and education

Gender profiles for surveyed informal settlements are skewed towards male household heads (Table 1), for

Table 1. Household size (mean ± SD), household head, percentage employment and education for surveyed households in informal settlements in Windhoek, Namibia.

	Site			All sites
	7/8st Laan	Havana	Okahandja Park	
Household head (%): Male	67	79	76	**74**
Female	33	21	24	**26**
Average members per household	4.15 ± 2.09	4.59 ± 2.93	6.14 ± 2.77	**4.93 ± 2.73**
Percentage Employment (%)	27.50	28.95	29.73	**27**
Percentage Education (NSSC) (%)	27.50	35.14	24.32	**29**

the purpose of this study, "household head" was defined as the major the breadwinner. Households' had an average occupancy of almost 5 people, employment and education levels were low amongst surveyed households.

Income range and share of income on expenditure

Three food security indicators (HFIAS, HDDS, and MAHFP) (Swindale and Bilinsky 2006; Coates et al. 2007; Bilinsky and Swindale 2010) were used to assess the accessibility and nutrient diversity of food in informal urban settlements. The share of income on household expenditure was used to determine how much of the household income is allocated to food expenses. The type of coping strategies and the frequencies at which they were used was assessed using the questionnaire developed for the Coping Strategy Index (Maxwell et al. 2003).HFIAS is the continuous measurement of food insecurity through measuring accessibility of food stuffs in households over a time period of four weeks. The scale gave an indication of how food insecure households were, where a high score indicated high levels of food insecurity and lower scores indicated little to no food insecurity (food secure). The scale captured the household's experience on food insecurity through capturing information on feelings of uncertainty, perception of sufficient/insufficient quantities and quality of food. Food reductions and the consequences of insufficient food quantities were also recorded.

A startling 85% of households fell in the lower income ranges (<R2000), with very few (5%) households having income that exceeded R5000 on average for all study sites. Half of households for all sites spend over half of their income on food (Fig. 1), this in addition to income ranges may indicate that these household live in sever poverty.

Comparison of food security indicators

Households showed some diversity in dietary intake over a 24 hour period; where households ate on average more than half of the 12 food categories.

No significant difference ($p > 0.94$, $n = 116$, $\alpha = 0.05$) between sites were observed for the mean values in dietary diversity. However, quantities are not recorded by the HDDS, which may overstate nutritional intake. Cereals were the food group most consumed, while sugars were the second highest consumed food group (Fig. 2), which indicates high caloric diet amongst household. Pulses, legumes and nuts were the least consumed food group, followed by eggs, which may indicate inadequate protein intake, however meat products were consumed by over half of households over a 24 hour period; but it is important to note that often meat products reported where tinned goods. Miscellaneous category also had a high consumption by households across all three sites, where tea and coffee were the most commonly reported items for this category, adding little nutritional value to household's overall diets.

On average 6%, of households of a total of 116 households surveyed, reported having adequate food for every month for the year 2015/2016. January had the highest record (9 %) of reported food adequacy (Fig. 3), this may be due to food parcels received in December from relatives outside the city, as reported by some households. This emphasizes the lack of food present in households and severity of food insecurity within these communities. A significant difference ($H_{2, 116} = 41, 85$, $P < 8.17 \times 10^{-10}$) was observed between the number of "Months of Adequate Household Food Provisioning (MAHFP)" between 7/8[ste] Laan and Havana, as well as between 7/8[ste] Laan and Okahandja Park, highlighting possible differences in food resources and access for different communities.

Income range and HDDS did have a significant relationship (χ^2 (10, N = 94) = 23.09, **p=0.010**), where households with higher income ranges had higher dietary diversity scores, given that a positive relationship between employment and HDDS was also found, a possibility exists that finance has an influence on the dietary diversity of households. However, no significant relationship was found between shares of income on expenditure for all three
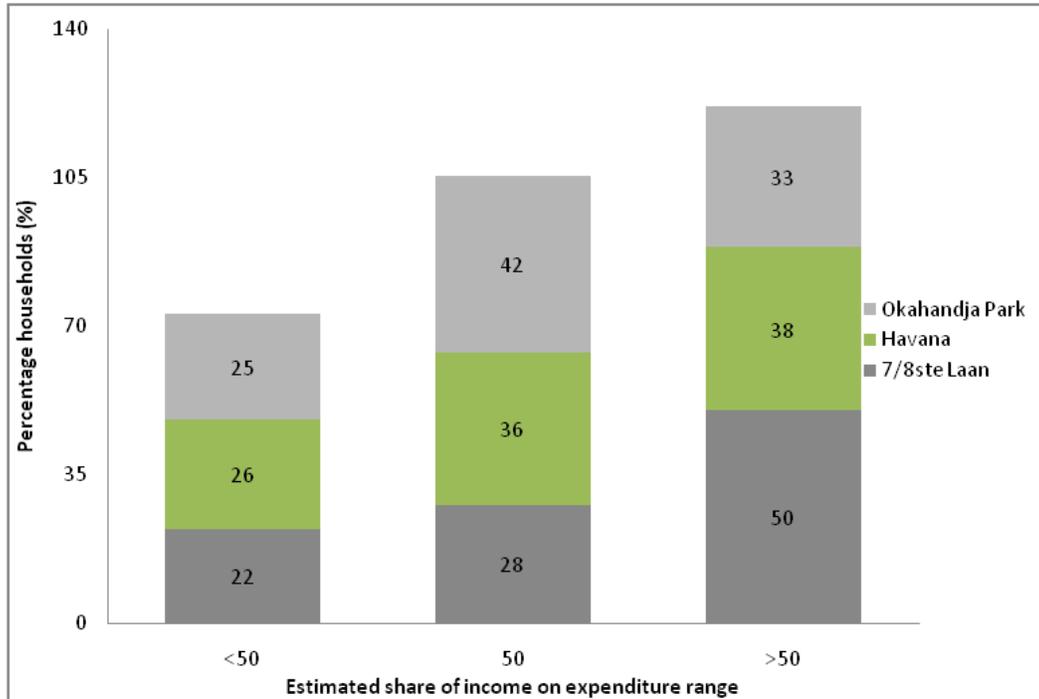
Figure 1. Percentage of households found in different "share of income on expenditure" categories for 7/8ste Laan, Havana and Okahandja Park, Windhoek Namibia, n=95.
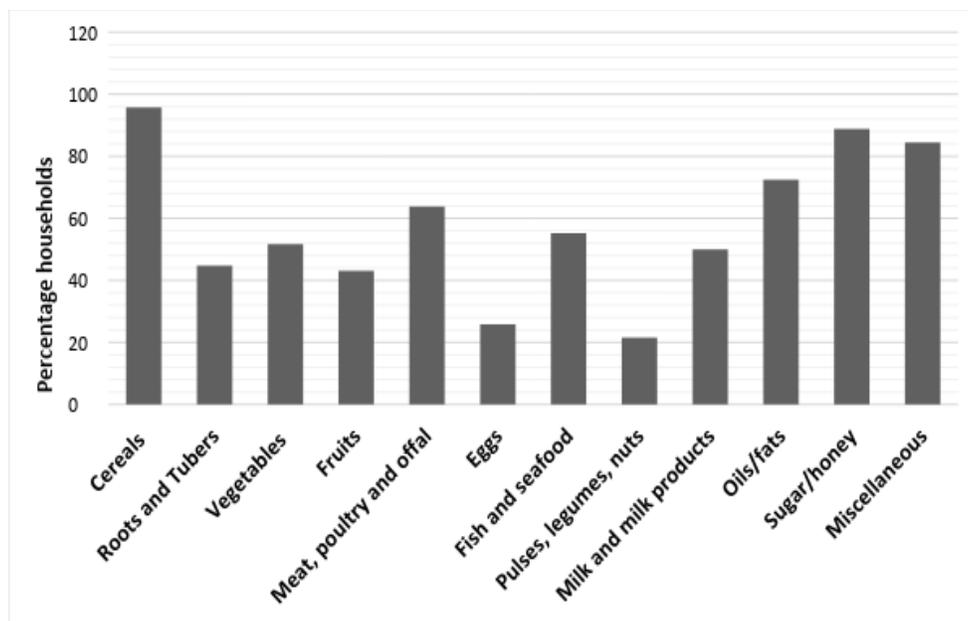

Figure 2. Summary of the 12 major food groups, outlined by FAO, consumed by households over a twenty four hour period during October 2016. n=116.

food security scores (HFIAS, HDDS and MAHFP), which was unexpected as households that spend less of their income on food were expected to have higher food insecurity levels. Nevertheless, it is important to take into consideration that low income levels of most households already indicate poverty, thus the expected trend may not present itself within this sample.
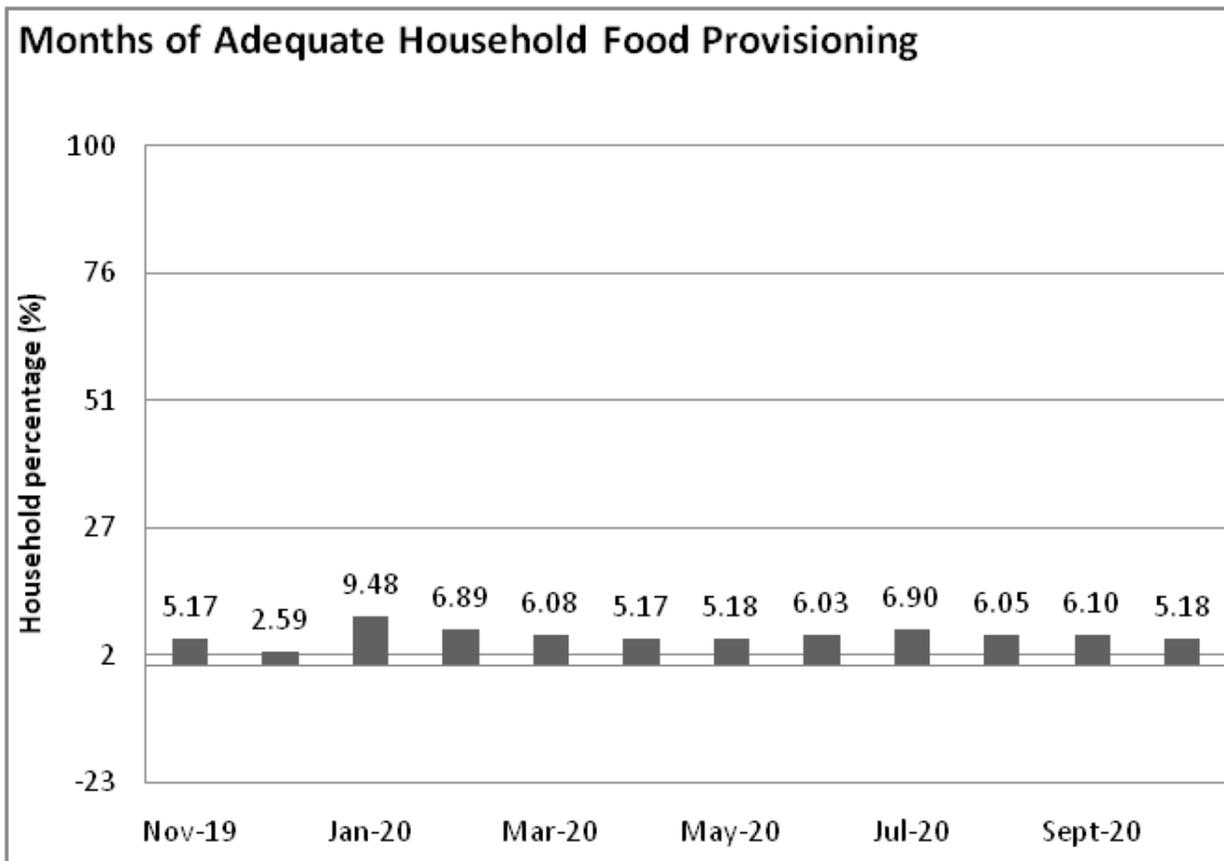
Figure 3. Percentage of households in informal settlements (Windhoek, Namibia) that self-reported months in which they considered to have adequate food for their entire household, n=116.

Relationship between socio-economic variables and food security indicators

Household Food Insecurity Access Scores (HFIAS) show that surveyed households for 7/8[ste] Laan, Havana and Okahandja Park are severely food insecure, where more than 80% of households fell within this category. Chi-square test for independence was conducted to test the relationships between social-economic variables (gender, number of members per household, employment, income range, and share of income on expenditure) and the three food security scores (HFIAS, HDDS and MAHFP) (Table 2).

No significant relationship was found between the gender of head of households and HFIAS (χ^2 (3, N = 116) = 2.93, p=0.403) as well as HDDS (χ^2 (2, N = 115) = 1.28, p=0.527) and MHAFP (χ^2 (2, N = 116) = 2.71, p=0.259). This indicated that the gender of the head of household did not have an influence on the level of household food security. Furthermore, the number of members in households did not have a significant relationship with all three food security scores (Table 3), a finding which contradicts previous studies (Tantu et al. 2017), where households' size is directly linked to food security levels.

A significant relationship (χ^2 (3, N = 116) = 6.78, p=0.020) (χ^2 (3, N = 116) = 7.80, p=0.034) was found between employment and HDDS, as well as MAHFP, indicating that employment (in this study) may have an influence on households dietary intakes, as well as monthly access to food. However, it was interesting to note that no significant relationship (χ^2 (3, N = 116) = 5.14, p=0.162) existed between employment and the level of food security (HFIAS), which was surprising as employment has been shown to influence the level of food security of households, as employed household members are expected to have financial access to food. Furthermore, it was interesting to note, that the income range did have a significant relationship (χ^2 (15, N = 95) = 41.74, p<0.001) with HFIAS, despite the lack of relationship between employment and HFIAS. This suggests that other possible sources of income may be available to households, which are classically not defined by households as "employment". However, what remains consistent is that households with lower income ranges did have higher levels of food insecurity.

Table 2. Relationship of various socio-economic variables with HFIAS, HDDS and MAHFP for households in 7/8ste Laan, Havana and Okahandja Park in Windhoek, Namibia. Significant values are presented in bold.

		Significant	n	χ² value	d.f.	Asymptotic. Significance (2-sided)
Gender	HFIAS	No	116	2.930	3	p=0.403
	HDDS	No	115	1.280	2	p=0.527
	MAHFP	No	116	2.705	2	p=0.259
Number of members per households	HFIAS	No	116	2.313	9	p=0.985
	HDDS	No	115	4.676	6	p=0.586
	MAHFP	No	116	2.516	6	P=0.867
Employment	HFIAS	No	116	5.135	3	p=0.162
	HDDS	**Yes**	115	**7.797**	2	**p=0.020**
	MAHFP	**Yes**	116	**6.779**	2	**p=0.034**
Income range	HFIAS	**Yes**	95	**41.736**	15	**p<0.001**
	HDDS	**Yes**	94	**23.089**	10	**p=0.010**
	MAHFP	No	95	16.447	10	p=0.088
Share of income on expenditure	HFIAS	No	111	7.662	6	p=0.264
	HDDS	No	110	8.000	4	p=0.092
	MAHFP	No	111	6.393	4	p=0.172

Table 3. Summary of average prices (mean ± SD), for the year 2017, of a basket of selected food items at informal markets (Kukka shops) and street markets for 7/8ste Laan, Havana and Okahandja Park, Windhoek, Namibia. Average cost is represented in bold. Kukka shops n= 4, 5 and 2 for 7/8ste Laan, Havana and Okahandja Park. Street markets n= 4, 5 and 1 for 7/8ste Laan, Havana and Okahandja Park. Okahandja Park's street market data are for one market only.

	Study sites					
	7/8ste Laan		Havana		Okahandja Park	
	Basket Cost (R)	No. of items	Basket Cost (R)	No. of items	Basket Cost (R)	No. of items
Kukka shops	**252.80** ± 91.95	17.25 ± 5.06	**124.6** ± 58.50	10.60 ± 3.97	**135.29** ± 30.82	12.5 ± 2.12
Street markets	**18.34** ± 17.53	5.25 ± 1.89	**33.10** ± 9.24	7± 2	**4.43**	7

Household coping strategies

The most commonly used type of coping strategy for households was changing their diets during periods when access to food was low. In all three study sites dietary change was the most frequently (everyday) used coping strategy, where households in Okahandja Park had the highest frequency for this coping strategy. Rationing strategies was the strategy used the second most, by households across all three sites, however this strategy was employed less frequently. The least used coping strategy was decreasing household members, furthermore growing food is not a strategy used by poor households. Overall it appears when coping strategies are used they most often fall under dietary changes and rationing strategies.

Physical accessibility of study households to formal markets

Fifty-two formal food markets were recorded for urban Windhoek for the purpose of this study, from these 52 only fifteen where found to be within 1.6 km of the extensions in which the study sites fell (Fig. 4). Havana extension had the least number (3) of formal markets that were within 1.6 km of its vicinity, while Okuryangava extension (Okahandja Park) had the highest number (9) of formal markets within 1.6 km of its vicinity. The presence of formal markets within the boundaries of the extensions in which the study sites occur, indicate that these areas are not classified as food deserts, however it is important to note that due to the lack of border data for informal settlements, distances to these markets may be understated, due to the location of informal settlements on the fringes of the respective extensions, making these sites possibly "food deserts".

Informal market prices and vendor's perceptions on pricing

Two types of informal markets were found within the study sites; Kukka shops and street markets. Kukka shops are small "convenient" stores that are normally built out of congregated iron; these are often found to stock non-perishable goods and fresh bread. Street markets are generally found along the main roads that enter the settlements, fresh fruit, vegetables and snacks are sold in these markets.
The cost of a basket of food items at a Kukka shop was found to be the highest at 7/8ste Laan, followed by Okahandja Park (Table 3). The number of items per basket ranged from 10−17 items. Havana had the highest average cost for food items for street markets in comparison to the other two sites; furthermore Havana also had the most fresh produce items available for sale (Table 3). Number of items present in a food basket for the street markets ranged between 7−9 items. The presence of fresh fruit and vegetable in these markets may explain the adequate food diversity found among the study sites.
Vendors from both Kukka shops and markets, reported a high cost of goods from suppliers and regular fluctuations of produce prices, despite this, price increases for goods sold at markets and Kukka shops were less variable for fear of losing customers. Prices for street markets are set daily for fresh produce, while Kukka shop vendor's change prices annually or biannually. Prices for fruit and vegetables are influenced by the degree of freshness, a practice observed by all vendors in study sites. All street market vendors have the same supplier for fruit and vegetables; however vendors may have varying prices due to transport costs involved for those located further away. The farmer's market from which all vendors obtain their goods is located within the same constituency (Tobias Hainyeko) as Okahandja Park, whilst 7/8ste Laan is located the furthest away. Given this proximity of the farmer's market to Okahandja park, it would be expected that prices would be cheaper within this area compared to the remaining two study sites, but it is difficult to make any concrete conclusions as the prices only one market was obtained.

National food basket prices (Namibia)

The data presented for this section were obtained from the First Capital food price monitor documents, compiled by First Capital Treasury Solution (Pty) Limited, which is an international financial services institute. Basket prices for an average household from five large supermarkets from selected months across three years (2010, 2016 and 2017) are displayed. The months displayed were selected based on the availability of data. There is variation in prices, items and quantity for items used to calculate the average cost.
March 2010 showed the lowest cost for a basket of food (Table 4), while September had the highest cost with 40 items. It is important that if viewed within the context of items per basket, January 2017 would then represent the time period with the most costly basket for an average household. Within a one year period starting from January 2016 to January 2017, the cost of a basket (both containing the same items) had increased by R123.07. A trend can be noticed as prices start to increase from 2010 to January 2017, which indicates that the cost of food for Windhoek has been dramatically increasing over the last seven years (Table. 4).

Intervention analysis

Forty-four project documents related directly or indirectly to food security were collected from government websites, from NGO's and corporate companies. These documents were sorted to analyze only those that affected urban food security, which resulted in a total of 21 project documents being reviewed for this section. Projects were categorized to look at food dimensions (availability, access, and utilization) and management strategies they targeted.
Few projects overlapped between food security dimensions, from the 21 projects analyzed. There are slightly more projects that overlapped between availability and access than between utilization and availability and utilization and access, where each combination had two projects respectively. These combinations however, do highlight that of the projects
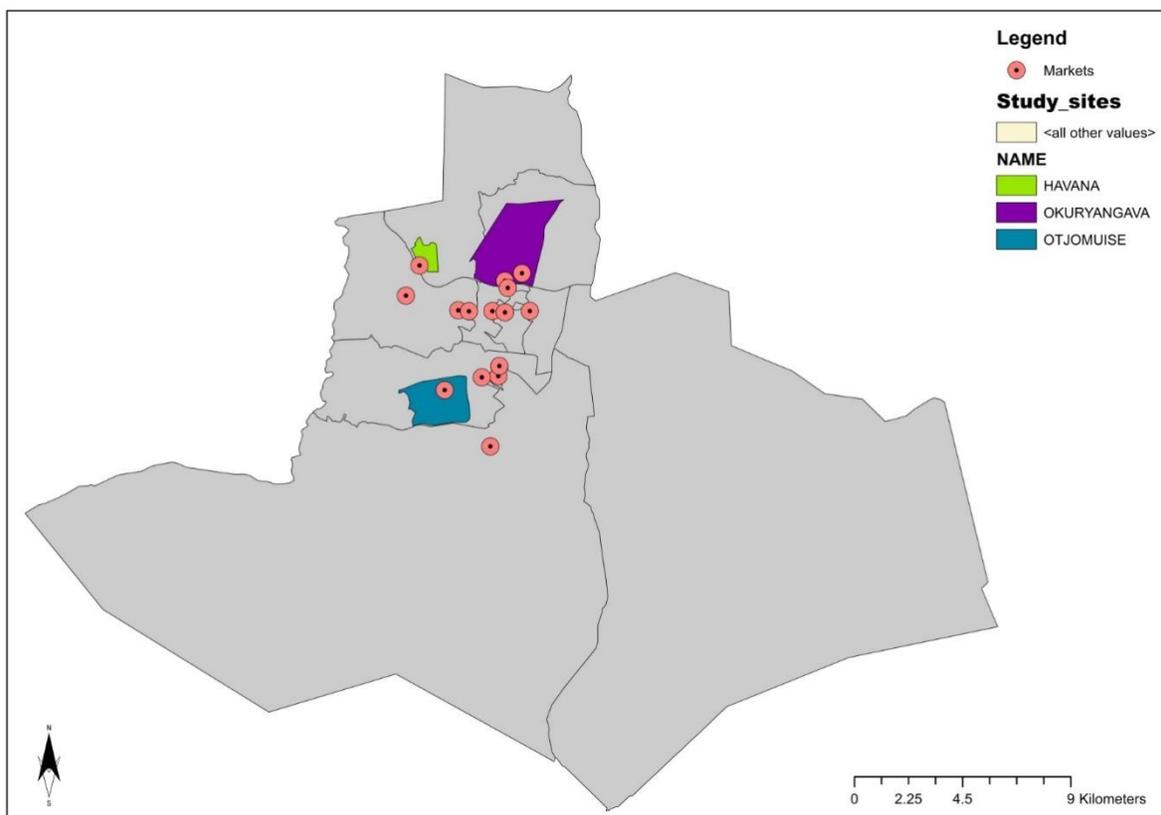
Figure 4. Map of urban Windhoek that shows mini- and super markets that are located within 1.6 km of Otjomuise (7/8st Laan), Havana (Havana) and Okuryangava (Okahandja Park), the extensions in which the three informal settlements (study sites) are found.

Table 4. Average cost of a basket of food (mean ± SD) for an average sized family in Windhoek, Namibia, for selected months.

	Windhoek					
	March 2010	Dec 2016	Jan 2016	Sept 2016	Nov 2016	Jan 2017
Av. Cost per basket (R)	420.97± 18.12	728±	969.10±	1201.67±22.82	1067.04±48.21	1092.17±46.29
No. of items	20	17	17	40	17	17

Adopted from: First Capital Treasury Solution (Pty) Limited reports for the years 2010, 2016 and 2017.

analyzed, availability of food to households is a dimension that is addressed in interventions to some degree. Almost fifty percent of projects analyzed covered the utilization aspect of the food dimensions, while the dimension that had the least projects addressed was access. Only one project out of the 21 reviewed fell within all three food security dimensions.

A large portion of projects fell within both the prevention and mitigation risk management categories, while coping did not overlap with any of

the other categories (Table 5). This indicates that projects aim to adapt to current situations, while simultaneously mitigating already existing situations. Coping strategies are considered as a short term solution as it does not directly solve the issue long term, but simply aims to cope with current adverse conditions; however no project exclusively aimed to mitigate risk.

Projects that aimed at increasing human capacity made up almost half of those reviewed, while improving education and/or increasing income made

Table 5. Summary of twenty-one urban interventions reviewed that affect Windhoek households.

Project	Food security Dimension			Risk management			Period
	Avail.	Access	utilization	Prevention	mitigation	coping	
Human Capacity							
Food and nutrition guidelines (nutrition education)			░	▓	░		2000
Computer laboratory programme for underprivileged schools			░	▓	░		2006-2011
House construction for informal households			░	▓	░		2010
Youth expo SME projects			░	▓	░		2009
Windhoek High School scholarship: For less privileged children			░	▓	░		2009-ongoing
Exchanges: Sharing, Learning by doing			░	▓	░		2010
Slum upgrading project			░		░		2010
Food fortification: introduction of standards on food fortification in Namibia to address micronutrient deficiencies in the general population	▓			▓	░		2011
Free primary and secondary education			░	▓	░		2013-current
Fee exemption on Primary health care for low income households			░		░		current
Institutional Capacity							
Healthy food regulation	▓			▓	░		2014-current
Namibian Alliance for Improved Nutrition (NAFIN)	▓	▓	░	▓	░		2014-current
Early warning: Food and nutrition Monitoring	▓		░	▓	░		2015-current
School feeding programme monitoring			░		░		Ongoing

Table 5. Continues

Food Based Distributions

Urban school feeding in selected government schools							2012-Current
Distribution of food items to low income households							2015-current

Employment and Income

Collateral free loans for SME"s (micro credit)							2012-2017
Saving groups for informal settlements							2010
Sales promotion and expansion for SME's							ongoing
Building partnerships for SME's							ongoing

up 24%. These statistics highlight the results found for the most prominent food security dimension being utilization. Food based distribution projects only made up 10% of those reviewed and those that aimed to improve institutional capacity made up 19% of reviewed projects.

Eleven projects (52%), of the 21 reviewed, are still ongoing, while 19% of reviewed projects only ran during the period of 2010 (Table 5), a very short time, questioning the effectiveness of these projects to create long term results, as food security issues often require long term interventions.

Household's perceptions of interventions

Households surveyed from 7/8[ste] Laan, reported that they did not receive food parcels from the national food distribution project, while some households from Havana and Okahandja Park reported that they felt that there are discrepancies in how parcels are distributed and that elements of tribalism often comes into play. Some interviewee's from Okahandja Park further reported that community members involved in the distribution of food parcels often took some parcels for resale and /or chose family members and friends over other community members to be recipients of parcels.

DISCUSSION

Scope and intensity of food insecurity in informal settlements

Impacts of climate change will have a marked impact on African cities (Giugni et al. 2015). Food insecurity levels were high amongst informal households which are considered to be vulnerable groups. The 2015 world hunger report by FAO stated that countries who showed little progress towards reaching its MDG's goals on poverty reduction (period of 2014-2016) was due to political and social instability; Namibia was found to be amongst those countries. Despite Namibia's political stability, social inequality in the country is extremely high and this is evident in the country's national statistical reports over the last decade that indicate a high Gini coefficient (0.597), (NSA, 2011); High poverty levels are reflected in the low income levels. Water scarcity and high temperatures exacerbate food production, future climate scenarios indicate further drying and increased temperatures requiring a revision of current strategies to provide food for the vulnerable.

The gender of the household's head did not influence food security status, this is in contrast to previous findings where female- headed households are historically found to be more food insecure (Nickanor, 2013). Furthermore, household member number did not influence food security levels and this may be a reflection of the existing state of chronic poverty already existing within these communities (Tantu et al. 2017). Household employment levels did influence household's dietary diversity and months of adequate food provisioning, indicating that households may be able to diversify diets and increase monthly access to food if incomes are steady. However, incomes for this study group did not exceed R 5000 a month, a value found to be barely sufficient to meet basic household needs (Pendleton et al. 2012). Informal communities are often able to source additional income from a wide range

of sources making "formal employment" a weak indicator of household income (Nickanor, 2013). Nickanor's (2013) reported that households spend only a small share of their income on food expenses, the majority of respondents from this study reported spending over 50% of their income on food expenses. This difference may be due to the rapidly increasing cost of food over the past six years, as well as the continued low incomes earned by the residents of the poor households which fail to meet food inflation rates. The vulnerable status of these households, means that their adaptive capacity is inherently low (IPCC, 2007), therefore the combined factors of high market prices and continued low income may pose a real challenge in addressing food insecurity and poverty issues within these communities.

Ziervogel and Frayne (2011) showed that both formal and informal households in Windhoek experienced household food insecurity. The global financial crisis of 2011 was also felt in Namibia and its impacts are still visible., international markets remain volatile and global food prices continue to increase (Milesi-Ferretti and Tille, 2011).

Implications of dietary diversity and coping strategies to food security

The coping strategies used within these communities provides some insight to the resilience of their existing food system. The study group was found to self-report on having at least one meal per day, which was considered the norm within these communities, however, although households had 7 of the 12 food groups in one day, these were low in nutrition with cereals and sugar making up a large portion of food, a finding similar to urban communities survey in the Western Cape, South Africa (Battersby, 2012). The high dependency of households on cereals poses future risks as cereals yields are expected to decline in the future. Households within these communities often resort to decreasing both their food portions and number of meals a day to cope with food shortages, posing further risk to these communities, by further increasing their vulnerability to shocks in the food system (IPCC, 2007).

Distance, financial constrains or both?

Many of the markets found in Windhoek were clustered around the city Centre, however a few fully functional shops were present within 1.61km of the extensions in which the study areas occurred (Fig. 5). However, the distance of the informal settlements to these formal markets may be underestimated due to the use of extension boundaries and the use of Euclidian distances instead of street networks. Access to finances is a limiting factor, similar findings were shown by Nickanor (2013) who investigated female headed informal households' food security status, where households reported financial constrains playing a much larger role in market access than physical constrains.

Market prices are often driven by supply and demand where the government has few to no interventions on pricing, favoring profit−seeking behavior and a decline in urban food security (Rocha, 2006). Byerlee *et al.* (2006) stated that diversified diets of the urban dwellers most likely buffered them to some extent against the adverse effects of fluctuating market prices; however diversification of diets within surveyed households was low, emphasizing their high vulnerability towards changing food prices.

The study did shed some light on cost and diversity differences between formal and informal markets. The role of the two types of markets is open to debate, with the formal markets providing more diversity whereas the informal are targeting a niche community, are more easily accessed and sell produce in smaller volumes but at higher prices.

Are interventions meeting the needs of the urban poor?

Interventions ranged from addressing utilization, all the way to access dimensions of food security. Research shows that farming approaches need to be changed at rural and urban levels to increase biodiversity, livelihoods and food security (Garibaldi et al. 2017). Although urban interventions were found to be much less effective than those aimed at addressing rural food security, the country is taking steps to address food security within the urban context, albeit very slowly both across time and space. Kimani-Murage et al.'s (2014) statement that poor governance and poor planning is at the root of increased poverty within Sub-Saharan Africa, may also apply to Namibia. Urban food interventions have only started to receive attention post 2000, but are not receiving as much attention as their rural counterparts, an observation also stated by Nickanor (2013). A large number of urban interventions were targeted at increasing human capacity, but these interventions appear to be a by-product of other national agendas and not specifically designed to target food insecurity within the urban poor. The poor tend to remain in a poverty rut unless interventions tackle the drivers of the poverty at the correct spatial and temporal scales (Barrett and Carter, 2013).

Interventions placed a large focus on food distribution e.g the school feeding schemes and the national food bank projects. Food based distribution

provides a good tool to alleviate food insecurity problems in the short term, however countries should aim to lead households into a state of "self-food sufficiency". Urban agriculture would serve as ideal long term solution to improve food security levels amongst these households, by not only increasing food access, but generate additional through produce sales. Dima et al.'s (2002) study conducted in low-income households in Windhoek and Oshakati found that 79% of informal surveyed households were engaged in urban/peri-urban agriculture, a stark difference to findings now, as almost none of the survey households practiced any form of urban agriculture. There has been a change in urban culture over the years where household food production has become less popular as households prefer buying from markets, furthermore, informal households are located in areas that have poor water resources and soils that would make any type of agricultural production difficult.

Many interventions lasted only a very short time, some as short as 8 months e.g. the temporary halt to the national food bank scheme, under the Harambe prosperity plan, as well the closing down of the SME bank due to poor management, projects which both aimed to improve the standard of living amongst the urban poor. Elements of poor governance were also evident when there are discrepancies in beneficiary selection for interventions (a practice reported by surveyed households) leading to overall social unrest within these communities. Systems analysis has been shown to be a useful approach when trying to integrate food systems research with fiscal research (Burchi et al. 2011).

What does this mean for policy makers?

At the continental scale there is debate about whether sub-Saharan Africa can feed itself (Van Ittersum et al. 2016). Data confirm that often at national level, food security is met but not at the household level. Given that the biggest concern for households, with regards to access to food in urban Namibia, is finances, it would require government to assess their policies that will lead to streaming direct income to poor households. These can include several initiatives such as improved wages that reflect the reality of an economy in inflation, informal trade and income generating activities. However, for this to work, government will have to prioritize its national budget to support upliftment of poor households and cut down expenditure on non-priority areas. Furthermore, better implementation of the mandatory minimum wage, promoting and sustaining collateral free financing and improving social safety nets for the urban poor and other vulnerable groups, will lead to citizens that are better able to cope with the shocks of food prices.

Long term policy will have to look at attracting foreign investors to boost the country's economy, which will lead to improved livelihoods. Furthermore, effective decentralization of major services in the country will lead to improved service delivery, that may prevent flocking to cities, thus lowering the numbers of the urban poor.

CONCLUSION

Informal settlements in Windhoek suffer from severe food insecurity. The reliance on maize as the main source of food with little diversity of other foods, shows the need to not only focus on food insecurity issues within communities, but to emphasize both food and nutritional security. Reduced food intake may further increase the current and future vulnerability of these communities by hindering child development and reduce health. This increased vulnerability decreases the resilience of these communities to adverse effects, both in the present and the future. The location of informal settlements on the fringes of the city did not appear to drastically influence access to both formal and informal food markets for households, furthermore informal markets appear to fill a gap where formal markets are lacking; however the lack of finances to gain access to these markets is a huge hindrance for households to reach a food secure state. Furthermore, if food inflation rates continue to rise at this current rate while household incomes remain low, the situation will worsen beyond its current state (an already dire one).

It is important to understand that approaches, such as increased local food production in the form of agriculture, will only offer a very limited solution due to severe water scarcity and harsh environmental and climatic conditions in the country. Multi-disciplinary approaches, as well as multi-stakeholder buy-in are needed to find appropriate interventions for the country to reach its National Development Goals by 2030, as well as to meet the global SDG targets on poverty reduction and eradication of hunger.

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