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Household Food Insecurity Status and Determinants: The Case of Botswana and South Africa

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ABSTRACT

This study used a survey questionnaire to investigate the state and determinants of household food security in South Africa and Botswana. In South Africa, 1557 households in two District Municipalities within Eastern Cape Province participated in the study. In Botswana, data was collected from 506 in Southern Kanye, southeast District, and Gaborone households. The paper employed Household Food Insecurity Access Scale and Prevalence to investigate the state food security across the sample population. The Household Food Insecurity Access Prevalence was used to determine the characteristics of and changes in household food insecurity of the sample households. The linear and ordinal regression analyses were carried out to outline determinants of food insecurity in the region. Findings emanating from the current study show a high prevalence of food insecurity in both countries. Meanwhile, geographical location, household size, and socio-economic infrastructure emerged as common determinants of food security for Botswana and South Africa. The paper recommends state-mediated intervention to improve access to basic socio-economic infrastructure and address unemployment rates in both countries as key areas to improve food security status.

Keywords: Food access, food availability, food security, Household Food Insecurity Access Score

INTRODUCTION

Globally, food insecurity is a serious socio-economic problem that manifests itself in the form of hunger, malnutrition, and stunting due to limited access to nutritious food. It is a problem that has received much scholarly attention for many decades and has been identified by various governments as a development priority area. However, it remains difficult to find long-lasting solutions to the problem. According to FAO, IFAD, UNICEF, WFP, & WHO (2019), 1 in 9 people,

corresponding to 821 million people, are regarded as not having access to enough nutritious food to eat. Africa houses the most severely deprived people, currently estimated at three-quarters of the world's extremely poor (FAO *et al.*, 2019; Gonzalez, 2015; Grobler, 2016; World Bank, 2015). The World Bank (2015) estimated that 56% of the world's extreme poor are in Africa. It is a finding that also resonates with a report by the Grebmer *et al.*, (2019) in 2019 Global Hunger Index, which reveals that of the ten hungriest nations in the world, 6 of them are in Africa. This implies a high prevalence of hunger and undernourishment in Africa compared to the rest of the world.

This food insecurity challenge is further exacerbated by the fact that the African continent has been experiencing fast growth in population size, which is projected to double by 2050 (World Bank,2015) However, this population growth does not match per capita food production, which has declined by 20% between 1970 to 2000 in Africa (Abdulai, Barrett, & Hazell, 2004). Godfray *et al.*, (2010) caution that tremendous food production growth does not always translate to sufficient access to protein and energy as micronutrient malnourishment is shown to be prevalent in countries experiencing increased agricultural production. Accordingly, if the challenge of food insecurity is to be successfully addressed, increased agricultural production should also be accompanied by interventions that directly address the key underlying structural issues responsible for food insecurity. For example, structural inequalities such as the unequal distribution of the means of production, especially land, limited access to agricultural inputs to grow food, and income inequality that curtails the poor's purchasing power to access food on the market all need to be addressed. As succinctly articulated by Sen (1990), food insecurity is not a function of food production, considering that the world produces sufficient food to feed everyone. Instead, it is a result of inherent socio-economic structural factors that disenfranchise the poor. Other factors such as lack of meaningful employment opportunities, failure of small-scale agricultural production, uneven food landscape, ever-increasing food prices, failure to afford food, and lack of access to production resources are continuously negatively impacting food security (Altman, Hart, and Jacobs, 2009; Bahta, Wanyoike, Katjiuongua and Marumo, 2017). The risk of food insecurity has multiple determinants framed around the four aspects, namely, accessibility, availability, utilization, and stability. Also, these four aspects are affected directly and indirectly by various socio-economic factors. The impacts follow socio-economics lines and are significantly different both geographically and across different times.

Thus, in many African countries, hunger and malnutrition take place when there is plenty of food. This is mainly because most of the poor are not engaged in any meaningful economic activities that generate income and enable them to access nutritious food (Ahmed, Eugene, & Abah, 2007; FAO, IFAD, UNICEF, WFP, & WHO, 2018; Statistic South Africa, 2019). It is a challenge that does not even spare the economically stable African countries such as South Africa and Botswana (Asefa, 1991; Human Sciences Research Council, 2015; Bahta, Wanyoike, Katjiuongua, & Marumo, 2017). These two countries present striking similarities and differences that are significant in the analysis of food security. In terms of similarities, firstly, both countries have enjoyed high and sustained economic growth rates that are considered the best in Africa over the past decades (Acquah

et al., 2013; Bahta *et al.*, 2017). Secondly, reported rapid economic growth in these two countries is widely blamed for the failure to change the face of food insecurity (Bahta *et al.*, 2017; van der Berg, 2006). In Botswana, significant variation in food access is widely reported across areas in the Southern and Southeast Districts. In South Africa, households that experienced severely inadequate food access were observed in the Northern Cape (13%), Mpumalanga (13%), and the Northwest (12%) (Statistic South Africa, 2019). Meanwhile, in Northwest (24.5%), Northern Cape (21%), Eastern Cape (20%), KwaZulu-Natal (19%), and Mpumalanga (19%), households experienced the highest proportions of inadequate access to food. The values are above the national average of 15.8% for all provinces (Statistic South Africa, 2019).

The unequal food security status in both countries is not moving with economic growth, as evidenced by the fact that the number of poor households threatened by food insecurity has been increasing. The Global Food Security Index that assessed food security across 113 countries in 2015 ranked South Africa and Botswana at 41 and 46, respectively. However, the food security status in the two countries has further retrogressed, as shown by their 2018 rankings; South Africa has slipped by 4 points and Botswana by 6 points. Both countries are currently ranked at 45 and 52, respectively (The Economist Intelligence Unit, 2018). Although such changes do not represent a dramatic regression of the state of food security, in both countries, they do signal that people who are experiencing hunger are on the rise, albeit at a lower rate. Botswana and South Africa rank the highest on inequality levels in Southern Africa (Bahta *et al.*, 2017; Statistic South Africa, 2019; Coates, Swindale, & Bilinsky, 2007; Statistics Botswana, 2018). Regarding differences, South Africa is a renowned net food exporter, producing enough staple food (Statistic South Africa, 2019) while Botswana is a net importer of food products, with imports currently accounting for about 90% of the national food supply (Bahta *et al.*, 2017). These notable differences and similarities provide a comprehensive and deep base to critically examine the dynamics of food security as well as draw inferences that are widely applicable and can be used to inform future policy interventions.

This deepening food insecurity crisis, as evidenced by the increasing number of food insecure households in South Africa and Botswana, served as a strong motivation for this study. Central to this food insecurity challenge is the dearth of up-to-date scientific data that sheds a nuanced picture of the challenge and details the current state of food security within poor households. The existing information is limited to a few scattered quantitative and aggregate indicators at the national level that provide superficial reading, especially when it comes to the state of food security at the household /local municipality level, together with key determinants of food security. This is the gap that the author identified in this paper. Accordingly, this paper intends to address this gap by sharing the findings of a study that was undertaken in South Africa and Botswana. The case study approach was employed to profile the state of food security in Botswana and South Africa and identify context-specific indicators of food security in the two countries.

RESEARCH METHOD

Study Site

This study was undertaken in two countries known as the economic powerhouses of Southern Africa, which are South Africa and Botswana as shown in Figure 1. In South Africa, data collection took place in two district municipalities of the Eastern Cape Province, namely OR Tambo, Chris Hani, and Buffalo City, a metropolitan municipality. Meanwhile, in Botswana, data were collected in three geographical areas: Southern (Kanye), the South East District (Ramotswa and Tlokeng), and Gaborone as shown in Figure 1. The socio-economic profiles of the two study areas are presented below.

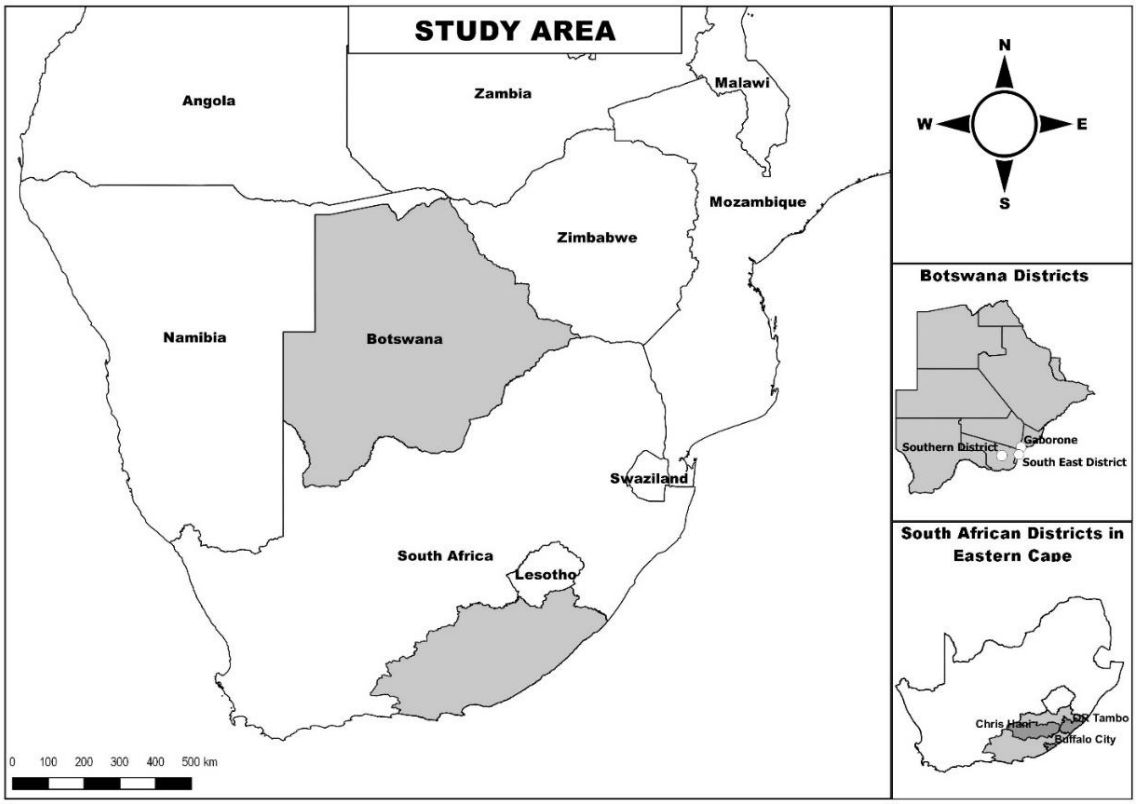

FIGURE 1. MAP SHOWING STUDY AREA SITES

South Africa is known to be food secure at the country level as it produces enough food and even exports the surplus. However, these national figures often hide widespread hunger, especially at the individual household level. Food availability varies from urban (formal) and informal areas, rural (commercial farms), and traditional homelands. The urban areas have well-pronounced food distribution networks that ensure the availability of food all the time when compared to rural areas. The number of food-insecure households has been gradually increasing over the years, especially in predominantly rural regions and host the former homelands, such as the Eastern Cape Province.

The province is chiefly rural, with 70% of its population residing in rural areas. It is ranked as one of the provinces experiencing the worst poverty in South Africa. According to the General

Household Survey released by Statistics South Africa in May 2019, nearly 60% of households are reported to be receiving at least one social grant (Statistic South Africa, 2019). The province's unemployment rate is estimated at 35.4%, which is a figure that excludes individuals who have given up looking for employment. Accordingly, the actual unemployment rate is even higher at 42.5% if the expanded unemployment rate is factored in (Statistic South Africa, 2019).

In the district municipalities where data collection was undertaken, the unemployment rates are as follows: Chris Hani 32.3%, OR Tambo 26.5%, and in the metropolitan city - Buffalo City 22.4% (Eastern Cape Socio Economic Consultative Council (Eastern Cape Socio Economic Consultative Council, 2017). In terms of poverty intensity, Chris Hani District is ranked at 43.1%, OR Tambo at 43%, and Buffalo City at 43%. Access to basic social amenities shows a huge disparity between rural and urban households, with 91% of households in BCM having access to piped water; 80.7% have access to electricity, and over 70.0% have access to sanitation services (Eastern Cape Socio Economic Consultative Council, 2019). Meanwhile, in district municipalities that are mainly rural, the proportion of households with access to basic social amenities is as follows: In Chris Hani, 72.7% of households have access to piped water, and 76.2% have access to electricity. In OR Tambo, 70.0% have access to electricity, only 11.6% of households have access to a flush or chemical toilet, and 37.7% have access to piped water. Within these settings, only 36% and 43.3 of the households in Chris Hani and OR Tambo, respectively, are involved in some form of subsistence agricultural production targeting to improve household food security (Eastern Cape Socio Economic Consultative Council, 2017). Both the two district municipalities and the province at large have great potential for agricultural production, which can contribute substantially to food security and employment. However, this potential remains relatively untapped. In fact, the study area has been experiencing some form of de-agrarian nation, and a recent research report by Statistics South Africa (2019) shows that only 27.9% of the province's households are engaged in agricultural activities.

Meanwhile, in Botswana, despite having high per capita income levels in Africa, the country grapples with the food security challenge at the country and household level. Unlike South Africa, which is food secure at the national level, Botswana is highly dependent on food imports, mainly because 70% of its total land comprises the Kalahari Desert. Botswana imports approximately 90% of its gross food supply from South Africa (Bahta *et al.*, 2017). The same publication reveals that approximately 3500 square kilometers on the eastern and northern margins of Botswana is reported to be suitable for crop and livestock farming which is pursued by smallholder livestock producers. Livestock farming is the dominant agricultural activity in Botswana and it contributes about 70% of the agricultural GDP (Bahta *et al.,* 2017; Statistics Botswana, 2017). Rainfall patterns are also sporadic and the country is plagued by water scarcity problems. These prevailing climatic conditions make the country susceptible to drought, thus dashing the hope of attaining food self-sufficiency (Nephawe, Mwale, Zuwarimwe, & Tjale, 2021). Accordingly, yields are poor, thereby exposing the masses, especially those in rural spaces, to hunger and malnutrition. When compared to their urban counterparts, households located in rural areas are the most vulnerable to hunger as food prices are reported to be much higher in rural spaces (Acquah *et al.*, 2013; Bahta *et al.*, 2017). The same authors

concur that the situation is further aggravated by the low income levels coupled with high unemployment rates prevailing in the rural areas, thereby limiting access to basic foodstuffs by the poor. Inequality is reported to be rampant, with about 20% of the population living below the poverty datum line, while 30% are either unemployed or under-employed (Statistics Botswana, 2017). This is the socio-economic context in which this study was undertaken. According to the Multi-Topic Household Survey, while poverty has been reduced to approximately 16% of the population, some 30% remain slightly above poverty line and are susceptible to a wide range of shocks (Statistic Botswana, 2018).

Data Collection

A cross-sectional survey design was employed with the aid of a semi structured questionnaire tool. Data was collected from 506 households in Botswana and 1557 households in South Africa. A stratified random sampling procedure aimed at stratifying households according to their socio-economic circumstances, namely, poor, better off and developed, was followed. In South Africa, data was collected from households in two District Municipalities, namely OR Tambo (662), Chris Hani (640), and one Metropolitan Municipality (255) that is Buffalo City, all located in the Eastern Cape Province. In Buffalo Municipality majority of the participants resided in informal settlements. In Botswana, data was collected in three geographical areas namely, Southern-Kanye (242) and South East District-Ramotswa and Tlokeng (108), and Gaborone (156). Respondents were the individuals responsible for food acquisition and preparations who were interviewed by trained enumerators. A pretested questionnaire was administered to collect data on household demographics,, socio-economic and food accessibility data using the Household Food Insecurity Access Scale (HFIAS). Data was analysed using SPSS. Descriptive statistical outputs such as: tables of frequencies, percentages and bar graphs on food security indicators covering accessibility, availability, utilisation and stability were generated. Separate linear and ordered logistic regression analyses were run for the two countries. HFIAS score, which is a continuous measure was used as the dependent variable for the linear regression whilst the categorical variable HFIAS prevalence was used as the dependent variable for the ordered logistic regression

Measurement of Food Insecurity

In this paper, household food insecurity status was measured by the HFIAS. The HFIAS measures the occurrence and frequency of food insecurity within households during the month prior to the survey (Coates et al., 2007). Four HFIAS indicators, namely Household Food Insecurity Access-related conditions (HFIA- conditions), Household Food Insecurity Access- related Domains (HFIA- Domains), Household Food Insecurity Access Scale Score (HFIAS score) and Household Food Insecurity Access Prevalence (HFIAS prevalence)) were employed to unpack the characteristics of and changes in household food security (access) of the sampled household. The indicators were computed for each household through questionnaire responses in relation to the various domains of food insecurity experience. The HFIAS score is a continuous measure derived from the sum of

the responses to measurement questions, ranging from 0 to 27. A high score, the more food insecure (access) the household experienced and vice versa. Because HFIAS is a continuous measure, Household Food Insecurity Access Prevalence (HFIAP) was computed in order to classify households into food insecurity categories namely; food secure, mildly food insecure, moderately food insecure, severely food insecure.

Regression Analysis

The multiple linear regression was used to check for linear relationship between food security and the household socio economic factors. In this case, the assumption is that HFIAS score (dependent variable) have linear relationship dependent variables and is represented by the equation below where:

$$y_i=b_0+b_1\ x_{i1}+\cdots+b_z\ x_{iz}+\varepsilon_i \quad (1)$$

whereby y_i is the value of the i th case of the HFIAS score variable;
z is the number of independent variables;
b_j is the value of the coefficient, $j=0,1,\ldots,z$;
x_{ij} is the value of the i th case of the jth independent variable and
$\mathcal{E}_i$ is the error term in the observed value.

To ensure that all the determinants of household' food insecurity status are captured accurately and conclusively, an ordered logistic regression was also used. The ordered categorical measure of household food insecurity namely HFIAS prevalence was used as a dependent variable. Since the dependent variable was categorical with more than two outcomes (1= secure; 2= mildly insecure; 3= moderately insecure; 4= severely insecure), the use of ordered regression was justified (Liu, 2009; Jega, Man, Latiff, & Wong, 2018). The same independent variables were used for both the linear and ordinal regression. The equation was modelled as follows:

$$Y^*=\alpha j+X\beta+\varepsilon \quad (2)$$

Where, Y = observed ordinal variable which is a function of Y* = that is unobserved or unmeasured variable. The measurement model assumes that category 4>3>2>1Y =f(Y*)
X = is the vector of independent variables
β = is the regression coefficients to be estimated
ε = is the error term
αj = is the threshold or cut points
Y* = is divided into some cut points or thresholds α1, α2, α3, α4, and α1< α2 < α3 < α4 Y ranging from 1 to 4. The food insecurity status category in which each household falls is expressed as:

$Y=1, \quad Y^*\leq\alpha1$
$2, \quad \alpha1<Y^*\leq\alpha2$
$3, \quad \alpha2<Y^*\leq\alpha3;$
$4, \quad \alpha3<Y^*\leq\infty$

As such, the probability that a household falls under a particular level of food insecurity can be expressed as:

$$\Pr Y \leq j/x_1,x_2,x_3,x_4 = \alpha j + -\beta_1 x_1 - \beta_2 x_2 - \beta_3 x_3 - \beta_4 x_4$$

$$\Pr[y \leq j/x] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \varepsilon$$

RESULTS AND DISCUSSION

State of Household Food Security in South Africa and Botswana: HFIAS and HFIAP

In South Africa, 68% of the surveyed households were within the severely food insecure category. The bulk of these households were from OR Tambo District (30.4%) and Chris Hani District (24.7%). In contrast, only 22.5% of households which interviewed in Botswana indicated that they were food insecure. Most (14.6%) of the households in this category were from the Southern District. Indeed, households in Botswana dominated the categories of food secure (21.3%) and mildly insecure (40.7%) as shown in Table 1.

TABLE 1. HOUSEHOLD FOOD INSECURITY ACCESS PREVALENCE IN SOUTH AFRICA AND BOTSWANA

HFIA Prevalence	South Africa n (%)				Botswana			
	OR Tambo	Chris Hani	BCM	**Total**	Gabarone	South East	Southern	**Total**
Food Secure	21(2.0)	32(2.1)	13(0.8)	66 (4.3)	33(6.5)	49 (9.7)	26 (5.1)	108 (21,3)
Mildly Food Insecure Access	44(2.8)	113(7.3)	26(1.7)	183 (11.8)	30 (5.9)	82 (16.2)	94(18.6)	206 (40.7)
Moderately Food Insecure Access	123(7.9)	110(7.1)	17(1.8)	250 (16.1)	27(5.3)	3(0.6)	48 (9.5)	78(15.4)
Severely Food Insecure	474(30.4)	385(24.7)	199(12.8)	1058 (68.0)	18(3,6)	22(4.3)	74 (14.6)	114 (22.5)
Total	662(42.5)	640(41.1)	255 (16.4)	1557(100)	108(21.4)	156(30.8)	242(47.8)	506 (100)

n- number of households

Meanwhile, under the category of moderately food secure access the results showed no significant difference as the proportion of respondents who answered in affirmative is almost equivalent; that is at 16.1% in South Africa and 15.4% in Botswana. In general, household distribution across various food security categories between the two countries is quite different. Results from South Africa are more skewed towards food insecurity while results from Botswana are skewed towards a food secure population. A possible explanation that can be used to explain such observed differences has to do with different social welfare programmes in these two countries. Botswana provides food parcels to poor families whereas South Africa provide social grants. It might be inferred that households in South Africa might use the social grants to buy non-food items leaving them vulnerable to hunger. Alternatively, such findings might be interpreted as showing the inadequacy of the social grants in improving food accessibility in South Africa.

The nexus between the household food access insecurity score and access to socio-economic infrastructure also provides an interesting insight to observations made above (see Table 2). The results show that more households in Botswana had better access to basic socio-economic infrastructure (water, health care facility, energy and all weather roads) and had on average lower HFIAS, implying greater food security when compared to South Africa.

The above results were further subjected to statistical testing to determine the accuracy of such findings. The independent sample t-test was applied and the findings show a statistically significant association of household food access insecurity score and access to socio-economic infrastructure is statistically significant. This finding shows that the prevalence of household food insecurity among the sample population in both countries was also influenced by access to socio-economic infrastructure.

TABLE 2. SUMMARY HFIAS AND SEI STATISTICS FOR SAMPLED HOUSEHOLDS IN SOUTH AFRICA AND BOTSWANA

Country and District		N	Mean HFIAS Score	SD
South Africa:		1557	11.43	±6.64
	Chris Hani	640	9.69	
	Buffalo City	255	11.61	
	Or Tambo	662	13.07	
Botswana:		506	8.13	± 6.39
	Southern	242	10.53	
	Gaborone	108	6.87	
	Southeast	156	6.96	
		N	Mean SEI	SD
South Africa		1557	11.7238	2.82425
Botswana		504	14.8849	2.17126

N- Number of households
SD- Standard deviation

Households Food Security Status and Socio-Demographic Factors

The distribution of households according to the food insecurity access category and demographic characteristics is shown in Table 3. Results indicate that for almost all categories, the proportion of households increase with a shift towards severely food insecure households in both countries. These results are in line with overarching findings that a greater proportion of households are within the food insecurity category. However, more households from Botswana were within the food secure category as compared to South Africa. Such an observation can be attributed to the various social security programs reported in Botswana, which target poor households that are more likely to be food insecure.

With regards to race, it is interesting to note that only one white household was within the severely food insecure category in contrast to 69.7% and 59.5% for Black and Coloured (respectively) counterparts in South Africa. These results can be linked to the racial inequalities in South Africa, where White households have access to more economic opportunities when compared to their Black, Coloured and Asian counterparts (Statistic South Africa, 2019). With regards to the correlation between educational achievement of the head of household and its state of food security, it is astounding to note that for both Botswana and South Africa, there were households headed by individuals with tertiary education (49.4% and 33.5% respectively) and yet were food insecure. This result highlights a probable disconnect between the possession of higher education qualifications and food security status indicating a paradox. It is a paradox in the sense that in most cases where

TABLE 3. DISTRIBUTION OF HOUSEHOLDS ACCORDING TO THE HFIAP AND DEMOGRAPHIC CHARACTERISTICS

Variables		Household Food Insecurity Access Categories							
		South Africa (n=1 557)				Botswana (n= 506)			
		Secure N (%)	Mildly secure N (%)	Mildly insecure N (%)	Severely insecure N (%)	Secure N (%)	Mildly secure N (%)	Mildly insecure N (%)	Severely insecure N (%)
Gender of household head	Male	36(6.7%)	94(17.4)	95(17.6)	314(58.3)	69(25.2)	133(48.5)	42(15.3)	42(15.3)
	Female	30(2.8%)	89(8.7)	155(15.2)	744(73.1)	39(17.8)	73(33.3)	36(16.4)	71(32.4)
Race	Black	52(3.7)	141(10)	235(16.1)	984(69.7)	107(21.2)	206(40.8)	78(15.4)	114(22.6)
	Coloured	11(9.1)	24(19.8)	14(11.6)	72(59.5)	1(100)	0	0	
	White	3(13)	18(78.3)	1(4.3)	1(4.3)				
Age	16-29 years	14(5.5)	37(14.5)	47(18.4)	157(61.6)	18(34)	26(49.1)	5(0.9.4)	4(7.5)
	30-50 years	34(5.4)	80(12.7)	103(16.3)	413(65.6)	46(23.4)	81(41.1)	28(14.2)	42(21.3)
	51-60 years	8(2.6)	30(9.7)	52(16.8)	220(71.0)	17(18.6)	41(45.1)	18(19.8)	15(16.5)
	> 60 years	10(2.8)	34(9.5)	48(13.4)	267(74.4)	27(16.4)	58(35.2)	27(16.4)	53(32.1)
Education	No education	4(2.2)	16(8.6)	25(13.5)	140(75.7)	12(8.8)	70(51.1)	12(8.8)	43(31.4)
	Informal	0(0)	1(2.2)	7(15.2)	38(82.6)	6(13)	19(41.3)	9(19.6)	12(26.1)
	Primary	8(1.7)	24(5.1)	58(12.3)	383(81.0)	16(17.6)	27(29.7)	28(30.8)	20(22.0)
	Secondary	37(5.4)	83(12.1)	129(18.8)	437(63.7)	39(27.5)	54(38.0)	17(12.0)	30(21.1)
	Tertiary	17(10.6)	59(36.6)	31(19.3)	54(33.5)	35(38.0)	36(39.1)	12(13.0)	9(9.8)

higher education levels are better placed to acquire employment which provides financial resources to ensure food accessibility. This finding might also be interpreted as signaling limited economic opportunities in both countries, that is Botswana and South Africa resulting in graduates being unemployed. Further clarification of this finding will be provided for by the regression analysis.

Key Food Security Indicators

The results of both linear and ordered logistic regression analyses with HFIAS and level of severity as the response variable and a set of indicator variables as explanatory variables for both Botswana and South Africa are shown in Table 4. Linear regression allowing for perceived categorical indicator and quantitative variables with the dependent variable being the HFIAS total score, which is a continuous

variable. The linear regression analysis was employed to identify variables that are related to food insecurity and in continuous form. Ordered logistic regression representing the severity of food insecurity, and ranges from category secure (1) to severe insecurity (4), therefore ordinal variable implying the use of ordered logistic regression.

TABLE 4. REGRESSION ANALYSIS RESULTS FOR HFIAS, HFIAP AND SOCIO-DEMOGRAPHIC CHARACTERISTICS

VARIABLES		SOUTH AFRICA				BOTSWANA			
		HFIAS	SE	Prevalence categories	SE	HFIAS	SE	Prevalence Categories	SE
Chris Hani (SA) and Southeast (BO)		-2.424***	(0.367)	-0.239*	(0.143)	-0.672	0.719	-0.326	0.279
BCM (SA) and Southern District (BO)		0.427	(0.526)	0.956***	(0.219)	-1.128**	0.134	-5.859***	1.142
Gender	Female	1.276***	(0.332)	0.480***	(0.126)	0.788	0.526	0.196	0.223
Race	Colored	-1.543**	(0.627)	-0.865***	(0.233)				
	White	-2.688**	(1.297)	-1.179***	(0.392)				
	Other	1.044	(5.772)	13.87	(761.6)				
Age	30-50 years	0.203	(0.455)	0.275	(0.170)	1.685*	0.995	0.490	0.367
	51-60 years	0.389	(0.540)	0.330	(0.210)	1.840*	1.090	0.535	0.415
	> 60 years	-0.168	(0.551)	0.315	(0.216)	1.327	1.053	0.345	0.400
Education	Informal	-1.043	(0.570)	-0.981	(0.578)	-0.690	0.991	0.119	0.457
	Primary	-0.908*	(0.501)	-0.458**	(0.217)	-1.129	0.793	0.0520	0.378
	Secondary	-1.914***	(0.507)	-0.321	(0.204)	02.209**	0.979	-0.547	0.431
	Tertiary	-4.853***	(0.683)	-1.137***	(0.249)	-0.972	1.184	-0.217	0.502
Income	Total Income					-1.76e-05***	4.60e-06	-598e-06***	1.84e-06
	Salaries/ Wages	-1.302**	(0.542)	-0.686***	(0.214)				
	Pension/ Grants	0.463	(0.496)	-0.00181	(0.208)				
	Other	0.118	(0.696)	-0.0303	(0.288)				
	Disability status	0.910	(0.786)	0.990**	(0.429)				
Livestock	Cattle number	-0.0790	(0.0562)	-0.00321	0.0234)	-0.0590**	0.0299	-0.0384***	0.0126
	Number of goats	-0.0573*	(0.0304)	-0.0362***	(0.0130)	-0.0284	0.0233	-0.00181	0.00899
	Number of sheep_	-0.0241*	(0.0123)	-0.00910**	(0.0043)	-0.0383	0.0354	0.0184	0.0143
	Number of pigs	-0.0356	(0.0392)	-0.0154	(0.0129)	-0.109	0.799	-0.323	0.254
	Number of chickens	-0.0589**	(0.0272)	-0.0235**	(0.0103)	-0.00415	0.0145	0.00461	0.00618
	Number of donkeys	0.0275	(0.236)	-0.126	(0.0792)	-0.787	0.0606	0.00176	0.0233
	Number of horses					1.511	1.128	0.327	0.657
Household size	0.129**	(0.0560)	0.0246	(0.0230)	0.163*	0.0957	0.127***	0.0469	
SEIAccess	-0.450***	(0.0643)	-0.118***	(0.0273)	-0.886***	0.146	-0.319***	0.0661	
Constant	18.79***	(1.175)			19.97***	2.587			
R-squared	0.273				0.25				

*** p<0.01, ** p<0.05, * p<0.

Firstly, household geographical location categorized according to district municipality explains a substantial variation in household food security across the investigated district municipalities. In South Africa, a household residing in Chris Hani was less food insecure by 2.424 in contrast to a household in OR Tambo, based on linear regression analyses. Similarly, the ordered logit for Chris Hani households being in a worse off food insecurity status category is 0.239 ($p<1$) less than OR Tambo households, while holding at constant the other variables in the model. The likelihood that households from Buffalo City are in a worse off food insecurity status is 0.956 ($p<0.01$) more than that of OR Tambo district municipality.

In summary, the results reveal that Chris Hani residents are more food secure (less insecure) in contrast to the comparator district, OR Tambo. BCM residents are on average more food insecure than OR Tambo residents. The study results reveal substantial food security variability across district municipalities than has been found in previous research surveys. In Botswana, a household in the Southern District was less food insecure by 1.128 in contrast to a household in the Gaborone District, based on linear regression analyses. Similarly, ordered logit regression results explain that Southern District households are less severely food insecure (5.589; $p<1$) than Gaborone District residents whilst holding other variables held constant. Regarding geographical location, residing in the Southern District of Botswana significantly affects household food insecurity status under the order logit model and therefore is the only coefficient interpreted. This finding is inconsistent with existing empirical evidence that has established that households that are located further away from all-weather roads that ensure access to markets are more food insecure when compared to those located close to better infrastructure (Bahta *et al.*, 2017). This finding highlights the rise of urban food insecurity, especially for those living within the low income neighborhoods (Jonah & May, 2019). Study participants from the urban settlement were mainly from the low income households as it was difficult to engage high income households due to security fences around the households. Indeed, urban areas do have adequate availability of foodstuffs which are not always accessible to everyone within the settings. Moreover, the cost of living in urban settlement is higher as compared to that of rural settlement. This affects the household food security status as some of the money is diverted to other household needs (Chakona & Shackleton, 2019). Accordingly, this might explain the findings of this study that show households residing in Gaborone and Buffalo Metropolitan were more food insecure when compared to other regions that are largely rural.

Meanwhile, the explanation that can be used to elucidate the finding that households in Chris Hani are more food secure when compared to those in OR Tambo region, despite the fact that both are largely rural districts, is that data collection in this area was done in locations that are close to rural towns. Here, the food retail environment is more pronounced when compared to rural areas that are located further away from such small rural towns.

Secondly, gender emerged as another significant correlate of food insecurity in this study but this was only the case in South Africa. Female-headed households are 1.276 scores more food insecure compared to the male-headed households and the ordered logit for females being more food insecure is 0.480 more than males while holding mother model variables

constant. Such an observation is agreement with previous studies that also observed the feminisation of poverty in South Africa (Statistic South Africa, 2018). The feminisation of poverty in South Africa implies that female headed households have limited and unequal access to resources, some of which affect food production and access. Poverty and food insecurity are interlinked. This phenomenon is expressed more within the rural areas, wherein household head gender is a determinant of level of food security (Tibesigwa and Visser, 2016; Kassie *et al.*, 2012; Altman, Hart, & Jacobs, 2009).

Size of Household size was also a significant determinant of household food security in both Botswana and South Africa. A bigger household was found to be more food insecure than smaller household. This may be due to more members that are economically inactive possibly children and old people signifying that such households have a higher dependence ratio. Larger households imply more people to feed and more resources needed in order to ensure food availability.

In South Africa, regarding race, Coloureds and Whites are more food secure than Black Africans. Relative to black Africans, Coloureds are -1.543 less food insecure or -0.865 less likely to be food insecure, while Whites are -2.688 less insecure or -1.179 less likely (odds) to be food insecure. The coefficients for White households are bigger (more negative) compared to Coloureds thus, implying White households are way better off (more food secure) than other population groups. These results are in agreement with the report by Statistic South Africa, which revealed that white-headed households have a higher average expenditure (four times higher) as compared to that of-black headed households in South Africa (Statistic South Africa A, 2018). There were no observed significant differences in household food insecurity between different races in Botswana.

Fourthly, a higher educational qualification increases the chances of being food secure, compared to lack of formal education in South Africa but there were no observed significant effects of education status on household food insecurity in Botswana. Relative to the absence of formal education, households with primary education, secondary education and tertiary education are more food secure in that order. The results for informal education were insignificant. These findings were aligned with the observations by Nwokolo, (2015) and (Ruhyana, Essa, & Mardianis, 2020) that higher levels of education are associated with increased household income, livelihood opportunities and food security.

When analysed as a quantitative variable, income level significantly reduces household food insecurity in Botswana. High income levels are associated with increased household food security and vice versa (Fraval, Oosting, de Boer, Lannerstad, & van Wijk, 2019). Unlike Botswana, household income data in South Africa data was collected as a categorical variable. Compared to households relying on agriculture as their main source of income, having salaries/ wages and trade income (i.e. non-agricultural income) reduces food insecurity by -1.3 points and this was significant at $p<0.01$ in South Africa. This could be due to the structure of agricultural production among rural areas of South Africa which is mainly seasonal and rainfed such that seasonal production must provide for the family needs for the rest of the year (du Toit, 2019). In comparison to agricultural production, salaries and wages provide

income and the means of accessing food throughout the year. Similarly, livestock ownership, such as cattle, goats, pigs and donkeys, reduces food insecurity in South Africa. In Botswana, only cattle ownership significantly reduces food insecurity. Livestock ownership is known in Africa for providing a hedge for small scale farmers against climatic risk and acting as a store of wealth which can be converted to required resources which include food and cash (Gwiriri, Bennett, Mapiye, Marandure, & Burbi, 2019). Households which own livestock are likely to dispose off in the event of food shortage in exchange for food.

The results strongly show that food security dynamics have context specific manifestations mainly linked to household size and household food environment. The common determinants of food security for Botswana and South Africa that emerged from the analyses were household size, geographical location and socio-economic infrastructure (SEI). The variables in the ordered logistic regression model accounted for about 27% (South Africa) and 25% (Botswana) of the variance in food insecurity. Marsden and Sonnino (2012), argued that food security has spatial attributes, since its production, distribution and consumption depend on household geographical location. Access to socio-economic infrastructure reduces food insecurity; this resonates with Sustainable Livelihoods Framework (Scoones, 1998), which argue that access to many streams of assets is a pre-requisite for survival.

CONCLUSION

This study provides a valuable baseline for critical insights and comparative analyses of household food security status for Botswana and South Africa and across different socio-economic groups. The applicability of both the HFIAS and HFIP scale cannot be overemphasized. There is a high prevalence of food insecurity in both countries; however, the determinants of food security are different between the two countries. And in cases when they are similar, the magnitude of the effect is not similar. Geographical location, household size; gender, race, education; source of income; livestock ownership and socio-economic infrastructure (SEI) emerged as significant factors in South Africa and geographical location; household size; age; source of income; livestock ownership and SEI significantly predict household food security in Botswana. The list of significant indicators reveals similarities with previous studies on food security although differences in terms of magnitude can be observed. Replicating this study at micro scale could allow a complete outline of determinants of food security and their magnitudes. Attaining food security in both countries requires the adoption of strategies or programmes that are cognisant of these variables in order of their magnitude as they emerge from the analyses. The micro scale analyses should put emphasis on factors that emerged as significant predictors of household food security as per each country in order of their magnitude. Policymakers and program administrators should desist from simulating outcome of food security indicators across Southern Africa or any geographical jurisdiction without due analyses.

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