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DYNAMICS OF SOCIETY, FOOD AVAILABILITY AND CONSUMPTION: UNDERLYING EVIDENCE FROM SELECTED SMALLHOLDERS IN SOUTH AFRICA

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ABSTRACT

The study examined the dynamics of society, food availability and consumption, a call for the promotion of health of community dwellers in South Africa. Food availability and dietary intake were discussed in terms of food groups available in society. The study group was selected through random sampling and before data collection, a pre-test of the questionnaire was carried out with the help of 15 enumerators who were trained for the purpose of this study. Structured questionnaires employed were divided into sections as follows: i) the socio-economic, demographic information and farm-level characteristics of respondents, ii) various food items and sources, iii) dietary and food consumption patterns. The food consumption frequency was captured through 7-day recall pattern suggested by World Food Programme (WFP) of the United Nations, commonly referred to as Food Consumption Score (FCS). Findings indicate that there was a high intake of cereals and tubers amongst men in the two villages (Mzinti and Kabokweni). Fulfilling the WFP principles, FCS was re-grouped into two clusters: poor, borderline as 'Acceptable' (1) and 'Unacceptable' (0). The outcome variable, FCS, was grouped as a dichotomous variable, categorized as 'Acceptable' with assigned value of 1 and 'Unacceptable' assigned 0. The determinants of food consumption were specified, using logistic regression. Overall, males (24%) had more energy intake (cereals and tuber) in Mzinti as compared to females (21%). However, results reveal that fruits and pulses were the least commonly consumed food groups over a 7-day recall period for Kabokweni and Mzinti. The findings also reveal that 60.97% of respondents in Kabokweni and 64.96% in Mzinti were within the acceptable food consumption score. The following variables: age ($p < 0.022$), level of education ($p < 0.006$ and $p < 0.039$), household size, ($p < 0.007$), extension services ($p < 0.001$ and $p < 0.028$), and farm experience ($p < 0.018^{**}$) were positively and significantly associated with FCS. Food insecurity impacts directly on physical, economic and mental health of people and understanding the food security status of communities is vital for planning. Additionally, the study underscores the relevance of obtaining necessary statistics for dietary diversity of households to support government policy making. An evolving and innovative policy direction is proposed for exploring the dynamics of integrating food security into government health programmes.

Key words: Smallholders, food insecurity, food consumption score, South Africa

INTRODUCTION

In the context of this paper, food security is explained as a situation “when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food that meet their dietary needs and food preferences for an active and healthy life” [1]. This contextual explanation is characterized by four primary dimensions of security as follows: availability, access, affordability and utilization. The availability context expresses having enough in both formal and informal markets that meet both human health and market demand. The food access context signifies having sufficient resources, economic and physical, to obtain enough foods required for a nutritious diet [2]. Additionally, it involves an individual's ability to obtain their food requirement regularly. As it relates to smallholder farmers, food access is affected by their own production practices, remittances or gift, switching, scrounging, food aid, donors, and purchases. Evidence suggests that majority of smallholder farmers are dependent on their own production and have limited access to other food products that they do not produce [3, 4]. In the food utilization perspective, households use the available food items to their advantage [2]. The quantity of food available in the household does not suffice as an indicator of food security for households but it also depends on financial resources, and ability to utilize food adequately through processing, storage, and stable sources of supply [5]. The underlying reasons for inadequate and reliable measurement of food insecurity is because of the challenges of understanding the dimensions of food insecurity [6], therefore, this calls for a need to further explore an in-depth determination of food insecurity amongst households. Though the definition of food security by the Food and Agricultural Organization (FAO) has gained universal acceptance, more information is needed on factors affecting food security throughout sub-Saharan Africa (SSA) population groups and this underscores the need for this study [7]. Additionally, in achieving food security, food-insecure households must be identified to allow for monitoring and evaluation [8].

Several empirical studies have recognized the synergies between food security, joblessness, poverty, health and inequality [9, 10]. However, because of inadequate data and reporting about food insecurity, more information is needed in South Africa [4]. The unabated poverty outlook in South Africa is ascribed to poor government policies. However, adequate farm return and several socio-economic factors are linked to food security, but this assertion has been criticized as unrealistic since income varies substantially amongst households that are engaged in farm production [9]. Therefore, these inadequacies underscore the relevance of the study, in that, the important factors such as household demographics, socio-economic variables, and some institutional variables will be captured and analyzed. Studies found a positive relationship between food security and demographic variables like

male gender, social capital, resources and government programs [11, 12, 13]. Similarly, the economic and social characteristics affect the food security status of youths in ways that differ from less privileged groups in society [14]. The study emphasizes the importance of obtaining necessary statistics for the dietary diversity of households to support the government in making policies that will assist in alleviating food insecurity. The study further proposed policy direction for investigating the dynamics of food security. Furthermore, policy discourse towards a new social paradigm to unify a regulatory system in fighting food insecurity is essential. Also, the study provides insight into the identification and characterization of households that are most vulnerable to food insecurity through specific measurement indicators. The paper argues that smallholder agriculture which thrives more in villages must be encouraged. Against these backdrops, the study examined the dynamics of food availability and consumption.

MATERIALS AND METHODS

Study site

The study was carried out in two rural villages: Kabokweni and Mzinti village in Mpumalanga province between March and September 2023. The local habitation of Kabokweni is very much linked to apartheid rules of forced removals. The township was categorized as being under the Kangwane Bantustan, established by the apartheid state as the homeland of Swazi people in South Africa. Kabokweni was declared a township in 1970 with a landmark of approximately 8.24 km square. The population is approximately 21,905 inhabitants, with 6,614 racially diverse households. Mzinti village is in Nkomazi local municipality, bordered by Mozambique to the East and Swaziland to the North [15]. Mzinti occupies an area of approximately 4,787km² with a population of 11,412 and 2,870 households. Although the area is also racially diverse, the majority are black Africans, and agriculture is the main source of livelihood [16]. The choice of these two villages is dependent on livelihood characteristics and nucleated patterns of settlement. In adherence to the "Declaration of Helsinki Ethical principles," confidentiality of respondents was assured, rights and freedoms were expressed, and they were also informed of their voluntary participation in the study. Further, adherence to the ethical clearance Protocol reference number: UMP/Msweli/201836335/magr/2023 was approved and obtained from University of Mpumalanga.

The study employed cross-sectional sampling techniques and discrete sampling frames in the choice of smallholders, samples were independently collected from each village, by specifying a single stratum indicator that shows similar sampling strata within each village [16]. There were 1121 and 1103 registered smallholder farmers in Kabokweni and Mzinti, respectively [17]. From the registered number of

farmers, a sample size was calculated for each village using Slovin's Formula [18]. Thus, the sample sizes adopted for the study were 294 and 212 for Kabokweni and Mzinti, respectively. Data were collected and prior to data collection, a pre-test of the questionnaire was carried out with the help of 15 enumerators who were trained for the purpose of this study. For ease of data collection with minimal errors, Open Data Kit (ODK) which is an assemblage of free and open-source software for gathering, managing and cleaning data was used [19, 20]. The questionnaire was divided into sections as follows: i) the demographic information and farm level characteristics of respondents, ii) various food items and sources, iii) and consumption patterns. The food consumption pattern was captured through 7-day recall pattern, commonly referred to as Food Consumption Score (FCS) [21]. The respondents were asked to indicate how frequently they ate a particular food item in the last 7 days before the survey.

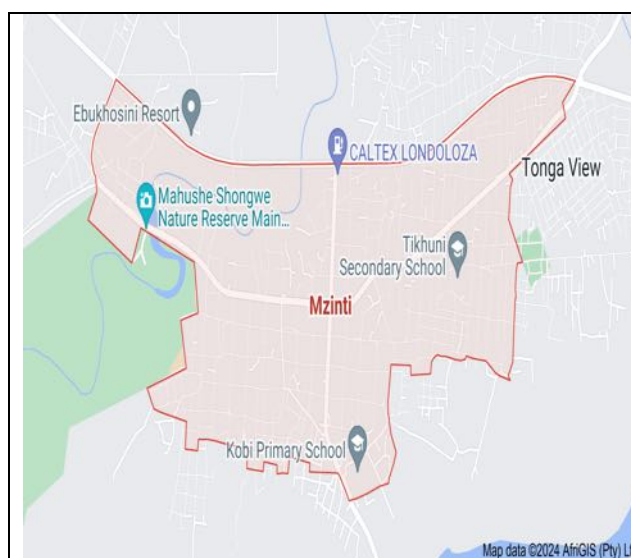


Figure 1: Map of Mzinti & Kabokweni



Figure 2: Map of Kabokweni

Measuring the Food Consumption Score (FCS)

Food Consumption Score (FCS) is a metric established by the World Food Programme (WFP) in 1996 for determination of food security. The FCS aggregates household-level data on the variety and frequency of food groups (main staples, pulses, vegetables, fruits, meat and fish, sugar, and oil) consumed over the previous seven days, thereafter, weighted according to the relative nutritional value of the consumed food groups [22, 23]. Food consumption score was prepared utilizing the information gathered on food consumption from the villages (Kabokweni and Mzinti) list of food items (Table 1). However, specific food items such as cereals are common staple foods that are accessible, while others like exotic fruits and dairy products are expensive and are seldom available for households [24, 25]. The questionnaire purposely did not ask questions on the number of times participants

took a particular food item because a household may take one food item several times in one day. Therefore, respondents were requested to indicate the number of days they had consumed different food items in the last 7 days preceding the survey. The food items (main staples, pulses, vegetables, fruits, meat and fish, milk, sugar and oil) were classified into eight food categories as indicated in Table 1.

The consumption frequencies of the eight categorized groups were summed up and assigned weights as shown in Table 1. Previous studies employed similar approaches in assessing food security through households' food consumption [26, 27]. Adopted formular for FCS, is indicated as:

$$FCS = \sum FiXi \quad [1]$$

Where F_i is the different food groups, i is the different food items and X_i represents the consumption frequency of each food group over the past seven days period. In addition, households were further categorized by applying the World Food Programme (WFP) recommendation as: poor food consumption ($FCS = 0 - 28$), borderline ($FCS = 28.5 - 42$), and acceptable food consumption ($FCS \geq 42$).

Model specification

In this study, smallholder farmers were assessed whether they had an acceptable FCS or not, using the WFP criterion for food security. Food consumption score was re-grouped into two clusters: 'Acceptable' (1) and 'Unacceptable' (0), that is a dichotomous variable. The determinants of food consumption were analyzed, by applying the binary logistic regression model as shown in Eq. (2) below:

$$y_i = \alpha_i x_i + e_i \quad [2]$$

Where y_i $\left\{ \begin{array}{l} 1 = \text{Acceptable FCS} \\ 0 = \text{Unacceptable FCS} \end{array} \right.$

Furthermore, the result is accepted to influence independent variables x_i , α_i , represents a vector of parameters to be estimated, while e_i is the error term. The belief is that the probability of y_i taking the value of 0 and 1 is the $1 - P_i$ and P_i , respectively; where:

$$P_i = \frac{e^{\alpha_i x_i}}{1 + e^{\alpha_i x_i}} \quad [3]$$

Therefore, the peripheral effects of independent variables can be approximated as follows: (Eq. 4)

$$\beta_{m.e.} = \frac{\partial (\alpha_i x_i + e_i)}{\partial (\alpha_i x_i)} \quad \beta_i \quad [4]$$

The selected variables employed in the binary logistic regression were informed by previous empirical studies [28, 29, 30]. The hypothesized variables (Table 2) with their direction, measurement and expected signs, with literature references are presented in Table 2 below.

RESULTS AND DISCUSSION

The descriptive statistics for demographic variables

The descriptive statistics of respondents are displayed in Table 3. From the two villages (Kabokweni and Mzinti), a total of 294 and 212 respondents took part in the survey, respectively. The percentage of male (35.7%) respondents in Kabokweni was more than that of Mzinti (29.2%). The average ages of respondents between 51-61 years appears similar in Kabokweni (22.4%) and Mzinti (21.2%), while respondents aged between 29-39 years recorded 25.2% and 14.2%, whereas participants aged between 40-50 years recorded 23.5% and 29.7% for Kabokweni and Mzinti villages, respectively. Most participants (55.4%) and (50.0%) were single in Kabokweni and Mzinti, followed by married (37.1%) and (36.3%), divorced (1.4%) and (0.5%), widowed (4.8%) and (2.4%), respectively. Most respondents (55.4%) and (46.7%) had secondary education, while respondents with primary education recorded 16.0% and 12.7% in Kabokweni and Mzinti, respectively. The respondents who had adult education (ABET) were 1.4% and 9.0% while tertiary education recorded 15.0% and 11.3% for Kabokweni and Mzinti villages, respectively. On average, household size between 1-4 members was 51.7% and 15.1% for Kabokweni and Mzinti, while household with 5-8 members were 38.4 and 48.1% for Kabokweni and Mzinti. Furthermore, households with 9-12, and >13 members recorded 1.0% and 8.5% for Kabokweni and Mzinti, respectively. Previous studies indicated that the average household size in sub-Saharan Africa is between 5-7 [31, 32].

The sizes of farmland were recorded in acres. Most of the surveyed respondents depended on farming as their primary means of livelihood with limited land sizes. Several respondents cultivated an average land size of between 6-9 acres representing 26.2% and 16.0% for Kabokweni and Mzinti, respectively (Table 3). The result shows that many of the respondents were subsistence farmers. Households with <5 years of experience in farming were 33.7%, while those with farm experience between 6-11 and 12-17 years recorded 26.2% and 16%, also 12-17 years of experience were 17.3%, and 20.3% for Kabokweni and Mzinti, respectively. Results further reveal that respondents who had 18-23 and > 24 years of farm experience recorded 13.9% and 8.8% for Kabokweni while 16.5% of respondents had 18-23 years farm experience in Mzinti.

The socio-economic characteristics of the participants

The disaggregated data for socio-economic characteristics of respondents in the survey is presented in Table 4. Results reveal dissimilar patterns in unemployment for Kabokweni and Mzinti with 73.8% and 29.2%, respectively. The employed respondents were 21.8% and 53.8% for the two villages, while the unemployed recorded 4.4% and 17%, also self-employed recorded 4.4% and 17.0% for Kabokweni and Mzinti, respectively, while the remainder were engaged in agricultural occupation which is considered as their primary employment. The percentage farm income of between R5000-R10000 (284.59 – 576.10 USD) earned by respondents recorded 6.85% and 16.5% for the two villages. Results further revealed that respondents who earned between R11000-R16000 (633.71 USD) were 8.5% and 7.1%, while 27.2% and 0.9% of respondents earned between R17000 -R22000 ((979.37 -1,267.42 USD) in Kabokweni and Mzinti, respectively. The respondents who had farm income of < R4000 were 2.0% and 75.0% in which villages, respectively?. Respondents who had more income were 55.4% and 0.5% for Kabokweni and Mzinti, respectively. In the two study areas, households were involved in different farm enterprises. Cultivation of crops was the most popular farm enterprise with 57% and 82% in Kabokweni and Mzinti. Livestock rearing and mixed farming recorded 19.4% and 4.7%, while mixed farming was 22.8% and 2.8% for Kabokweni and Mzinti, respectively. In the food sustainability category, 73.1% and 75.9% of the respondents asserted that their farming was sustainable while respondents who had different views were 26.9% and 24.1% for Kabokweni and Mzinti, respectively. In the survey, respondents were asked to evaluate the effectiveness of government projects on food security by choosing from the following items: effective, very effective, ineffective and uncertain. Data revealed that 6.8% and 88.2% of respondents agreed that government projects geared towards food security in the area were very effective. Furthermore, 58.2% and 4.7% of respondents from the two villages affirmed that government projects for food security were effective in their respective areas (Table 4). In the allocation of resources category, 2.7% and 10.8% of respondents were positive about the allocation of available resources while 17.7% and 1.4% confirmed satisfaction in in Kabokweni and Mzinti. However, 4.1% and 15.6% were dissatisfied. In the shared views of interviewed respondents, agricultural extension practitioners' visits on a monthly schedule recorded 76.9% and 9.9% for Kabokweni and Mzinti, respectively. Also, yearly visits recorded 10.2% and 75% while respondents who were never visited were 12.6% and 7.1%, respectively.

Food consumption by gender

Dietary intake was assessed in terms of food groups (Fig. 3 and 4). It is vital to consider food consumption patterns from gender perspectives since food distribution

in most communities is in favor of household-heads who are usually men. In addition, the elimination of the gender gap could assist in poverty alleviation and increase food security in communities. Previous studies also opined that there is usually gender discrimination in food and resource allocation in individual households, thereby placing women at risk of food insecurity [33, 34, 35].

Figures 3 and 4 present the bar graph depicting food consumption patterns by gender in Kabokweni and Mzinti. Findings indicate that there was an increase in cereal and tuber intake amongst men in the two villages. Overall, males (24%) had more energy intake (cereals and tuber) in Mzinti as compared to females (21%). Previous studies also affirmed that males consume foods that are higher in energy than females [36, 37, 38]. In the vegetable category, results from Kabokweni and Mzinti exhibited similar trends where females (10%) consumed more of vegetables and fruits than males (8%) in Mzinti (Figure 3). This finding is corroborated by the study of Alana and Stabile [39], who found that women have more affinity to consuming fruits, vegetables, legumes, sweets, cakes than men. In addition, findings of this study are also supported by the study of Davidson and Morrell [32] who found that females have more prevalence rate of malnutrition, stunting and underweight than males. In most instances, unhealthful dietary habits such as failure in consuming the recommended five fruits and vegetables daily and constantly eating impoverished nutrient fast foods and ready-to-eat meals are quite common especially in younger adults [41]. Results also indicate that the percentage of males (9%) consuming animal proteins and pulses was higher than that of the females (7%) in Mzinti; also, milk and sugar are mostly consumed by females than the male (Fig. 4). Cereals and milk were mostly consumed by females than the males in Kabokweni, while other food groups shared similar pattern of consumption (Fig. 3). In the two study areas, the pattern of oil consumption appeared higher in males than the females. Additionally, females appear to be more conscious of the role of nutrition on human health and are more prepared to adopt a healthier consumption pattern. Additionally, females are more worried about their body shape, body size, weight, height and conformation [42]. However, the causes of these differences in food consumption pattern may depend on cultural and environmental factors such as individual households' desire, dietary habits, beliefs and food choices.

Additionally, results reveal that, notwithstanding the gender perspectives, fruits and pulses were the least frequently consumed food groups over a 7-day recall period for Kabokweni and Mzinti with 6% and 4%, respectively. This result is consistent with the study of Adebayo *et al.* [43], who found that decreased consumption of fruits and vegetables among farmers in Ethiopia was because of limited access. Furthermore, the consumption of fruits and pulses was not as common as cereals and tubers amongst households in Ghana [44]. However, food selections may be influenced by

socioeconomic, cultural and household desire about food choices. Dietary habits may also be influenced by motivation to embrace healthy eating habits and lifestyle which encapsulates educational, social and economic factors [45].

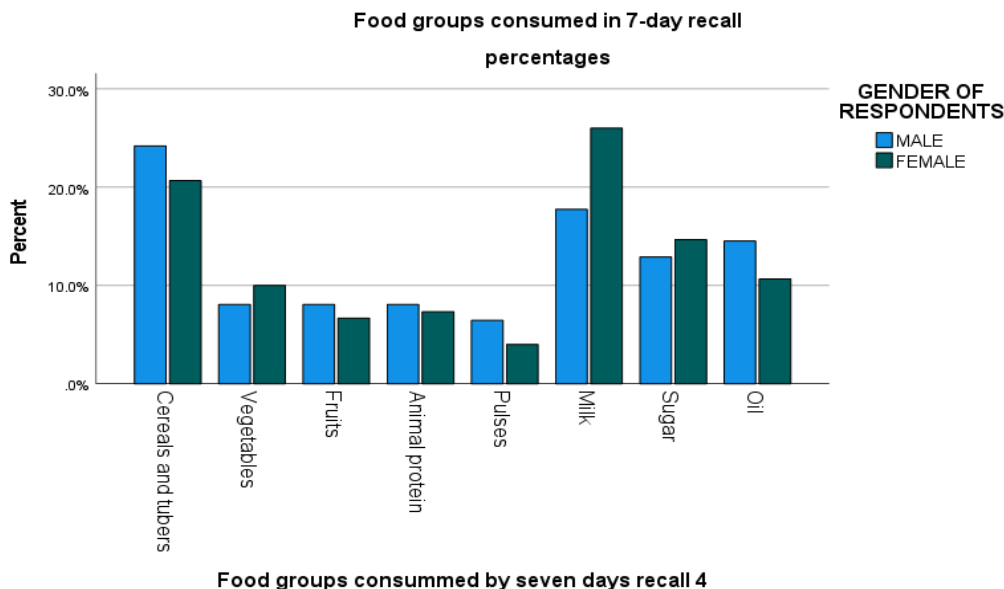


Figure 3: Food consumption by gender in Mzinti

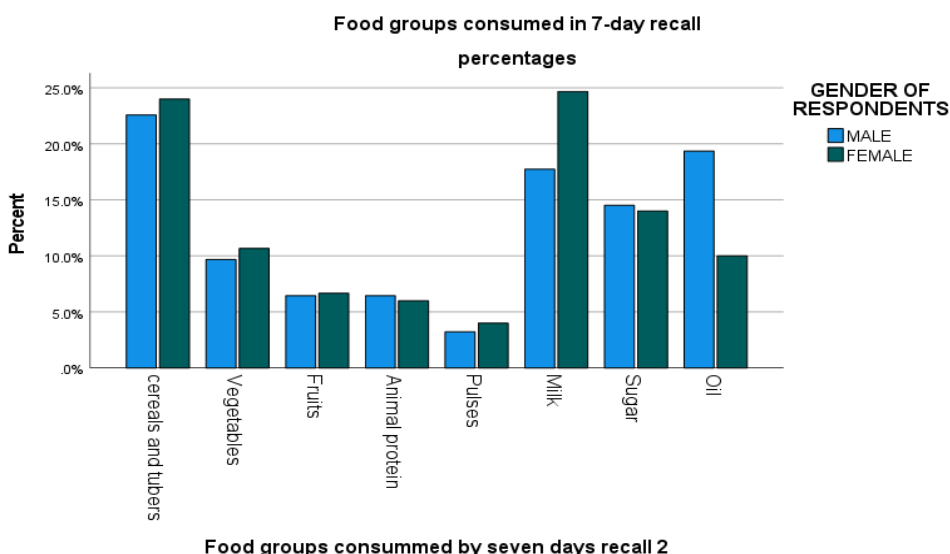


Figure 4: food consumption score by gender in Kabokweni

Data presented in Table 5 shows the food consumption score (FCS) for Kabokweni and Mzinti. Overall finding reveals that 60.97% of respondents in Kabokweni and 64.96% in Mzinti were within the acceptable FCS. This implies that many respondents were food secure, contrary to the popular assertion that most rural areas are food insecure. This result is expected since South Africa’s Department of Social Development (DSD) oversees and implements at least seven social grant

packages, which is primarily for the less privileged and vulnerable groups. The highest grant administered is the child support grant, followed by elderly persons grant, and disability grant. These grants are disbursed to qualifying beneficiaries on monthly basis [46]. The social security grant may have played a major role in enhancing the food security status of the respondents. Previous studies found positive effects of support grants on specific nutritional indicators and food security [47]. Nevertheless, FCS within the borderline was 35.02% for Kabokweni and 32.04% for Mzinti while the poor food consumption category for Kabokweni and Mzinti recorded 4.01% and 3.00%, respectively (Table 5).

Model fitting summary for determinants of food consumption in Kabokweni and Mzinti

The summary showing the determinants of food consumption patterns for Kabokweni and Mzinti is presented in Table 6. In the data analysis to determine the model fit, results show that the Omnibus Tests of Model Coefficients was < 0.001 for both Kabokweni and Mzinti data (Table 6). The goodness-of-fit: -2 Log likelihood = 269.56; Cox and Snell R Square = 0.233; and Nagelkerke R Square = 0.336 for Kabokweni. Similar variant for Mzinti recorded the goodness-of-fit: -2 log likelihood = 144.785; Cox and Snell R Square = 0.409 and Nagelkerke R Square = 0.583 while the Hosmer and Lemeshow test recorded a value of 0.056 and 0.60 for Kabokweni and Mzinti, respectively. These indicators suggest that the model was appropriate for the study [40,41]. Therefore, in this study, the accepted level of significance was set at 0.05, 0.01; and 0.001 for all independent variables in the study. Additionally, the multi-collinearity precaution was observed using the variance inflation factor (VIF) to disallow correlation of independent variables which may cause weakness in the statistical strength of the model [38, 44].

The determinants of food consumption in Kabokweni and Mzinti

As presented in Table 7, out of 18 variables employed in the analysis, four variables from Kabokweni and three from Mzinti were statistically significant and positively influenced acceptable FCS. These variables are as follows: age, level of education, household size, extension services, and farm experience. Age in Kabokweni positively and significantly influenced the probability that a household would have an acceptable FCS, provided all antecedent variables are held constant. This result suggests that each additional year of age is associated with a 38% unit increase in household acceptable FCS (Table 7). This result is corroborated by the study of Nchanji and Cosmas [23], who found that heterogeneity of adolescent population in terms of age, economic, and social characteristics influenced food security in ways that differ from adult populace [43]. Further, the authors contend that adolescents depend on their parents or family members for food, while older ones are less likely to be dependent on their parents for food.

Results (Table 7) indicated that the level of education for both Kabokweni and Mzinti positively and significantly influenced FCS with a $p < 0.006$ and $p < 0.039$ for surveyed respondents in Kabokweni and Mzinti, respectively. The corresponding value of the marginal effect indicates that the possession of additional education increases the likelihood of an increase in acceptable FCS by 33% for Kabokweni and 44% for Mzinti, provided that all other covariates are held constant (Table 7). This finding lends credence to the study of Omara *et al.* [41], who found that 51.0% of those who participated in livelihood education programs were more food secure compared to 31.5% of households who did not participate [25]. Further, educated households are better informed and able to develop skills, resources, and assertiveness that allow them to diversify their income sources to receive extra income that assists to withstand shocks and vulnerability, thus cascading into household food security.

The size of household is positive and statistically significant ($p < 0.007$) but recorded a negative coefficient ($\beta -0.686$) which implies that the effect of food security on household size is constrained. This suggests that an increase in household size will induce a 68% decrease in acceptable FCS of household. Accordingly, the study of Aurino *et al.* [16], also found that households with larger family size are more likely to experience food insecurity [57]. A similar study carried out by Harris-Fry *et al.* [58], asserted that the size of household must be proportional with available food at household level. In contrast, the study of Harris-Fry *et al.* [40], on smallholders' food security and vulnerability also found that household size had positive and significant relationship to food security in Ethiopia [39].

In both villages (Kabokweni and Mzinti), household access to extension services recorded a positive and significant ($p < 0.001$ and $p < 0.028$) association but negatively ($\beta -1.982$ and $\beta -0.396$) correlated with the likelihood that a respondent would have acceptable FCS, while all variables remain constant. This finding implies that, an increase in extension services received by a respondent would result in a decline of acceptable FCS by 98% and 39%, respectively, provided all variables are held constant. However, the study of Klasen and Claudia [21] found that access to extension support increases the likelihood of being food secure. The authors argued that the positive finding could be attributable to the vital role of extension in linking farmers to market and other opportunities like exposures to farm credits and subsidies for farm business. Further, Agholor [42] in their study on the determinants of farmers' access to agricultural markets in South Africa, also found that access to extension services increases the probability of adopting marketing strategies open to the farmers. Moreover, another study found that extension services offered to farmers increased their participation in government support programs [17].

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

The study examined the socio-economic and demographic characteristics, and determinants of food security of households in Kabokweni and Mzinti villages in South Africa. Dietary intake was assessed using the FAO's FCS measure. Findings indicate that there was a high cereal and tuber intake amongst men in the two villages. Overall, male had more (cereals and tuber) intake in Mzinti as compared to females. Smallholder agriculture which thrives more in villages must be encouraged. There is less dissent today than there were years back about the importance of smallholder agriculture being an essential component of food supply. In South Africa, a policy discourse towards a new social paradigm to unify a regulatory system to fight food insecurity is essential. An evolving and innovative policy direction is proposed for exploring the dynamics of integrating food security into government health programmes.

Implications of the findings

Food security is a demanding concern in South Africa, where millions of people struggle to access enough and healthful food. The implications of food insecurity in the country are far-reaching and devastating. Some of the most noteworthy effects include malnutrition and related health problems, particularly among children and vulnerable populations, increased poverty and inequality, as households spend a large portion of their income on food, decreased economic productivity and growth, as a starving workforce is less efficient. Another implication is that food insecurity may also trigger social unrest and instability, as food shortages and price increases lead to frustration and anger. Furthermore, food insecurity negatively impacts on education, as hungry children are less likely to attend school or perform well at school. Additionally, food insecurity exacerbates existing social and economic challenges such as unemployment and inequality. Policy discourse in addressing food security is critical for realizing sustainable development and safeguarding the well-being of all South Africans.

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Table 1: Food items, groups, and weights

Food items	Food groups	Weight
Maize, maize meal, rice, pasta, bread and other cereals, cocoyam (Taro or Amadumbe), potatoes	Cereals and tubers	2
Vegetables and edible leaves	Vegetables	1
Fruits	Fruits	1
Beef, meat from goat, fish, poultry, mutton, pork, other meat, and sea foods	Animal protein	4
Beans, peas, lentils, peanuts, and others	Pulses	3
Milk and other milk products	Milk	4
Sugar, honey, and sugar products	Sugar	0.5
Edible oils, fat, and butter	Oil	0.5

Table 2: Variables hypothesized with their operational description, measurement and expected signs

Variable	Description/measurement	Expected sign	References
Age	Age of respondent 20 – 30 years = 1; 31 – 40years = 2; 41 – 50 years = 3; 51 – 60 years; = 4, >61 = 5 (continuous variable)	+/-	[31, 60]
Gender	Participant gender: Male =1; female = 0 (dummy variable)	+/-	[31]
Marital status	Married (1) or single (0)	+	[63]
Level of education	Years of education (continuous variable)	+	[34]
Household size	Number of people in a household (continuous variable)	-	[4, 34]
Employment	Work other than farming: employed=1; unemployed=2 (dichotomous variable)	-	[64]
Farming experience	Number of years in farming: < 4years = 1; 5 – 10 years = 2; 11- 14 years = 3; 15 – 20 years = 4; > 20 years = 5 (continuous variable)	+/-	[65]
Farm size in acres	Size of farmland in acres (continuous)	-/+	[66]
Extension services	participant's access to extension services: 1 = yes, 0 = no (dichotomous variable)	+	[36,67]

Table 3: Descriptive statistics of demographic variables

Kabokweni (n= 294) pooled			Mzinti (n=212) pooled	
Variables				
Age				
	Frequency	%	Frequency	%
18-28	44	15.0	31	14.6
29-39	74	25.2	30	14.2
40-50	69	23.5	63	29.7
51-61	66	22.4	45	21.2

>62	41	13.9	43	20.3
Total	294	100.0	212	100.0
Gender				
Male	105	35.7	62	29.2
Female	189	64.3	150	70.8
Total	294	100.0	212	100.0
Marital stats				
Single	163	55.4	106	50.0
Married	109	37.1	77	36.3
Divorced	4	1.4	1	0.5
Separated	2	0.7	-	-
Widow	14	4.8	5	2.4
Widower	2	0.7	23	10.8
Total	294	100.0	212	100.0
Level of education				
No school	36	12.2	43	20.3
ABET	4	1.4	19	9.0
Primary school	47	16.0	27	12.7
Secondary school	163	55.4	99	46.7
Tertiary	44	15.0	24	11.3
Total	294	100	212	100.0
Household size				
1-4		51.7	32	15.1

5-8		38.4	102	48.1
9-12		8.8	60	28.3
>13		1.0	18	8.5
Total		100.0	212	100

Farm size in acres

<1	2	0.7	96	45.3
2-5	67	22.8	78	36.8
6-9	105	35.7	19	9.0
10-13	101	34.4	12	5.7
>14	19	6.5	7	3.3
Total	294	100.0	212	100.0

Farming experience

<5	99	33.7	15	7.1
6-11	77	26.2	34	16.0
12-17	51	17.3	43	20.3
18-23	41	13.9	35	16.5
>24	26	8.8	85	40.1
Total	294	100.0	212	100.0

Table 4: Socio-economic characteristics of the participants

Kabokweni (n=294) pooled			Mzintini (n=212) pooled	
Variables				
Employment status				
	Frequency	%	Frequency	%
Unemployed	217	73.8	62	29.2
Employed	64	21.8	114	53.8
Self-employed	13	4.4	36	17.0
Total	294	100.0	212	100.0
Farm income				
< R4000	6	2.0	159	75.0
R5000-R10000	20	6.8	35	16.5
R11000-R16000	25	8.5	15	7.1
R17000 - R22000	80	27.2	2	0.9
> R23000	163	55.4	1	0.5
Total	294	100.0	212	100.0
Type of farm enterprise				
Livestock	57	19.4	10	4.7
Crops	168	57.1	187	88.2
Mixed farming	67	22.8	6	2.8
Other	2	.7	9	4.2
Total	294	100.0	212	100.0
Food Sustainability				

Yes	215	73.1	161	75.9
No	79	26.9	51	24.1
Total	294	100.0	212	100.0

Effectiveness of the government projects on food security

Very effective	20	6.8	187	88.2
Effective	171	58.2	10	4.7
Ineffective	96	32.7	6	2.8
Uncertain	7	2.4	9	4.2
Total	294	100.0	212	100.0

Resource allocation for food security projects

Very satisfied	23	10.8	8	2.7
Satisfied	52	17.7	3	1.4
Undecided	220	74.8	73	34.4
Less satisfied	2	0.7	80	37.7
dissatisfied	12	4.1	33	15.6
Total	294	100.0	212	100.0

Contacts with Extension practitioners

Forth night	1	0.3	17	8.0
Monthly	226	76.9	21	9.9
Yearly	30	10.2	159	75.0
Never	37	12.6	15	7.1
Total	294	100.0	212	100

Table 5: Food consumption score in Kabokweni and Mzinti

Outline of food consumption	Total pooled	Kabokweni	Mzinti
	(N=506)	(N=294)	(N=212)
Food consumption score ($\bar{x}$)	63.25	36.75	26.5
Poor food consumption (%)	10.24	4.01	3.00
Borderline food consumption (%)	39.75	35.02	32.04
Acceptable food consumption (%)	50.01	60. 97	64.96

Table 6: Model fitting summary for Kabokweni and Mzinti

Goodness-of-fit-test (Kabokweni)			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	269.561 ^a	0.233	0.336
Omnibus Tests of Model Coefficients			
	Chi-square	df	Sig.
	77.834	13	< 0.001
	77.834	13	< 0.001
	77.834	13	< 0.001
Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	6.742	8	0.565
Goodness-of-fit-test (Mzinti)			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	144.785 ^a	0.409	0.583
Omnibus Tests of Model Coefficients			
	Chi-square	df	Sig.
Step	111.452	9	< 0.001
Block	111.452	9	< 0.001
Model	111.452	9	<0.001
Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	6.365	8	0.606

Table 7: Determinants of food consumption in Kabokweni and Mzinti

Determinants of food consumption (Kabokweni)								
Variable	B	S. E	Wald	df	Sig.	Exp(B).	Lower	Upper
Age	.381	.166	5.237	1	.022**	1.463	1.056	2.027
Gender	.071	.340	.044	1	.834	1.074	.552	2.090
Marital status	.100	.175	.328	1	.567	1.106	.784	1.559
Level of education	.331	.122	7.411	1	.006**	1.392	1.097	1.767
Household size	-.686	.254	7.296	1	.007**	.503	.306	.828
Employment	-.047	.288	.027	1	.871	.954	.543	1.678
Farming experience	-.184	.144	1.637	1	.201	.832	.628	1.103
Farm size	.243	.197	1.517	1	.218	1.275	.866	1.875
Extension services	-1.982	.382	26.910	1	.001**	.138	.065	.291
Constant	.513	1.837	.078	1	.780	1.670		
Determinants of food consumption (Mzinti)								
Variable	B	S. E	Wald	df	Sig.	Exp(B).	Lower	Upper
Age	.071	.286	.063	1	.802	1.074	.614	1.880
Gender	-.503	.371	1.839	1	.175	.604	.292	1.251
Marital status	.138	.184	.561	1	.454	1.148	.800	1.646
Level of educational	.445	.215	4.279	1	.039**	1.560	1.024	2.379
Household size	.324	.199	2.654	1	.103	1.383	.936	2.042
Employment	-.468	.270	3.009	1	.083	.627	.369	1.063
Farm experience	-.452	.191	5.604	1	.018**	.636	.438	.925
Farm size	.115	.212	.294	1	.588	1.122	.740	1.701
Extension services	-.396	.180	4.856	1	.028**	.673	.473	.957
Constant	-1.469	1.792	.672	1	.412	.230	-	-

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