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An Economic Analysis of Household Dietary Diversity in South Africa

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Abstract

Food security research and its measurements are pivotal to the achievement of the sustainable development goal number 2 under the global agenda 2030, of the United Nations. South Africa as a country has also committed itself to the National Development Plan to ensure that no one goes to bed hungry by 2030. The achievement of this goal would have been failed if the type of food being considered is not a balanced diet that leads to a healthy and productive life. Against this background socio-economic determinants may influence Dietary Diversity from a Food Security perspective. The objective of this paper thus is to analyze dietary diversity among Households in South Africa, from a socio-economic perspective. Using the General Household Survey data based on 20908 households, household head characteristics such as age, gender, household size income, and poverty status were analyzed. Univariate and multivariate analyses were conducted and a regression model was used to analyze the socio-economic variables. the results reveal that households with lower income had a lower Dietary Diversity as access to food of different groups was found to be correlated with higher levels of income and poverty status. The study contributes to the food security discourse in making recommendation as regards to ways of providing assistance that may mitigate the challenges associated with dietary diversity at the household level. It is recommended that policymakers should take note of the impact of socio-economic circumstances on Dietary Diversity that may lead to negative health consequences.

Keywords: dietary diversity; households; determinants; characteristics, GHS cs, GHS

Introduction

Food security remains one of the most fundamental challenges globally. In September 2015 member countries of the United Nations adopted the 2030 Agenda for Sustainable Development, including 17 Sustainable Development Goals including Goal number 2 to eradicate hunger by 2030 (United Nations, 2015). Despite successes to reduce the number of undernourished people in the developing world since 1990, an estimated 820 million people in the world still experience hunger (FAO, 2019) Furthermore it is estimated that approximately 2 billion people globally experience moderate or severe food insecurity (FAO, 2019). In this context the Food and Agricultural Organization (FAO, 2015) defines food security as "when all people, at all times, have physical, social and economic access to sufficient, safe and **nutritious food** that meets their dietary needs and food preferences for an active and healthy life". The Food and Agricultural Organization (2019) in this context indicated that "The lack of regular access to nutritious and sufficient food that these people experience puts them at greater risk of malnutrition and poor health" South Africa as a country has also committed itself in the National Development Plan to ensure that no one goes to bed hungry by 2030. Furthermore, several researchers (Ruel, 2002; Popkin, 1994; Rashid et al, 2006; Hampton, 2007; Nord and Parker, 2010) indicated that food security studies should not only focus on calorie intake but also on the

diversity of intake. Studies showed a positive relationship between food security and dietary diversity at the household level (Grobler, 2018; Thorne-Lyman et al, 2010). In this regard households may be "Food Secure" but may be low in terms of "Dietary Diversity". Maxwell et al (1999) indicated that food security may be too complex to be "captured" by a single indicator. Related to this argument Migotto et al, (2006) suggests that different methodologies can be used to assess food insecurity namely; measuring undernourishment, measuring food intake, measuring nutritional status, measuring food access in terms of income, and measuring vulnerability.

In this regard food insecurity becomes a multi-dimensional concept. Lenhart and Read (1989) defined food insecurity from a nutritional perspective as "a condition resulting from chronic under consumption of food and/or nutritious food". Coates et al (2007) indicated that households can experience food insecurity (access) in different ways including; feelings of uncertainty or anxiety over food; perceptions that food is of insufficient quantity; **perceptions that food is of insufficient quality** (including dietary diversity and nutritional inadequacy) and reductions of food intake. This paper focuses on the access perspective of food insecurity. Against this background socio economic determinants may influence access to food and may impact on Dietary Diversity from a Food Security perspective. The objective of this paper thus is to analyse dietary diversity among Households in South Africa, from a socio economic perspective. In low income areas the lack of income may lead to food insecurity but in moderately food insecure households a lower dietary diversity may be found (Grobler, 2018). As a result of this problem, it is important to consider the socio economic variables that may lead to lower dietary diversity. In this context low dietary diversity are associated with negative health consequences (Bronte-Tinkew et al. 2007).

Purpose of Research
The purpose of the research is:
1) To study the link between Food Insecurity and Dietary Diversity at the Household Level;
2) To analyse dietary diversity among households in South Africa, from a socio economic perspective.

Research Questions
The research questions are:
1) Which socio economic factors influence dietary diversity at household level?
2) To what extend do poor households eat from a diverse group of foods?

Based on the studies of Labadarios et al (2011) and Taruvinga et al (2013) which consider determinants of dietary diversity food insecurity can be analysed. Huang and Tian (2019) in a recent study analysed the impact of food accessibility on dietary patterns by using a regression model.

Methodology
Sample
This paper is based on secondary data collected by Statistics South Africa in 2018 as part of the General Household Survey (GHS). This survey is a national survey based on a sample of 20908 households across all provinces in South Africa. In the questionnaire, Statistics South Africa used a number of questions related to food security that were asked to the household head in the survey. In this regard questions were also about the types of food the household ate in the last 24 hours. In this context 10 questions representing 10

different food groups, ranging from maize and basic food staffs to meat, vegetable, and oils were included. The household was asked to indicate whether they ate the food group and how many times in the past 24 hours. For purposes of this paper the responses were converted to 1 if they ate the food group regardless of how many times they ate it, and 0 if they did not eat that food group. Based on this convention, a dietary diversity score (DDS) was calculated by adding the responses to all the 10 questions, and hence a household that ate all the food groups had a score of 10 and those that ate none of the food groups had a score of 0. A score of 10 indicates a household with a high dietary diversity, while a lower score indicates a household with a low dietary diversity. The dietary diversity was further categorised into three categories namely, low diversity which comprised of a DDS of 0 to 3; and a moderate diversity which comprised of DDS of 4 to 6 and then a high diversity score ranging from 7 to 10.

Model Specifications

In the analysis of the social economic determinants of dietary diversity, besides the contingency tables that will be used to show the range of diversity in the different categories of households, a regression model is used, to statistically test the significance of the household characteristics that may explain the variation in the dietary exposure of households. Since the dietary diversity score is calculated by adding up the responses, the DDS can be considered a quantitative variable that can be used as a dependent variable in an Ordinary Least Squares regression model. Thus the model to be estimated is as follows:

$$DDS_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 D_1 + \beta_5 D_2 + \varepsilon_i$$

Where DDS is the Dietary Diversity Score in the model and. β_0 is the constant which is the average value of DDS when all the other variables are equal to zero. β_1 to β_3 represents the coefficients for the quantitative variables X_1 to X_3, and β_4 and β_5 represents the coefficients for the dummy variables D_1 and D_2. The independent variables are age of head of household, household size and household income which was converted to log of household total income. The dummy variables are D_1 for gender defined as 1 for males and 0 for females and poverty status defined as 1 for poor household and 0 for non-poor households. Thus the estimated regression is as follows;

$$DDS_i = \beta_0 + \beta_1 Age_i + \beta_2 Household\,size_i + \beta_3 Log\,of\,income_i + \beta_4 D_1 + \beta_5 D_2 + \varepsilon_i$$

Your writing should be organized in the following manner; introduction, purpose of the study, objectives/research questions, theoretical framework, methodology (which includes your respondents and how the research was carried out), literature review, findings, discussion, limitations, recommendation and conclusion. Figure 1 below illustrates the suggested outline of the paper.

Literature Review

Huang and Tian (2019) state that there is a lack of studies in food security that analysed the impact of food accessibility on dietary patterns and nutritional status. Assenga and Kayunze (2016) indicated that another form of measurement of food security may be to look at dietary diversity.

Food Insecurity

From the household perspective the Food and Agricultural Organisation (FAO) (2013) indicated that Dietary Diversity can also be used as a proxy indicator of food

access. In this regard the FAO (2013) indicated that dietary diversity can be calculated by looking at the number of food groups consumed over a given period. The most commonly used measure of food security is the Household Food Insecurity Access Scale (HFIAS) proposed by Coates et al (2007). In this scale household food access is defined as the ability to acquire sufficient quality and quantity of food. Coates et al (2007) indicate then in this food security measurement context that "the HFIAS reflects three universal domains of household food insecurity that is anxiety about household food insecurity, insufficient quality and insufficient quantity of food". Coates et al (2007) states as a limitation to the measurement scale that it captures the perception about food insecurity regardless of the nutritional composition of the food. In this regard a household may be regarded as food secure without a high dietary diversity.

Dietary Diversity

Several researchers (Ajani, 2010; Hilbruner and Egan, 2008; Steyn et al; 2006) describe dietary diversity as a situation where adequate access, availability and utilization of food exist. Ruel (2002) and (Vakili et al, 2013) define dietary diversity as the number of food groups consumed in a household. Vakili et al (2013) and Dillon et al (2015) further indicated that Dietary Diversity can be used as a proxy indicator of the level of food access from a food security perspective. Several studies showed a positive relationship between income and nutritional status at the household level (Shariff et al, 2015; Salois et al, 2012; Huang and Tian, 2019). In this context Huang and Tian (2019) indicated "the diet of people with income levels considered poor is often dominated by staple food because it is the cheapest calorie source". Jensen and Miller (2010) found that as income of household increase, attributes like taste became more important and result in an increase in the number of food groups consumed. Tian and Yu (2015) found that as income increase staple food is replaced by animal meat and healthier food. Assenga and Kuyunze (2016) in a study stated that "food insecurity observed in their study could be associated with limited access to food due to limited financial resources". Annim and Frempong (2018) found in a study that access to credit and income increased dietary diversity in Ghana. Studies by Smith et al, (2003) and Lucheo et al, (2013) found a positive relationship between a low level of education and malnutrition and food insecurity. Hirvonen (2016) in a study found that higher household wealth and higher level of parental education were positively associated with dietary diversity in urban areas compared to rural areas. Allcot et al (2017) refer to the concept of the availability of healthy food in low income neighbourhoods which may be lower compared to high income areas which may lead to lower dietary diversity in poor neighbourhoods. Others studies showed a positive relationship between household sizes and dietary diversity (Moon et al, 2002; Woldehanna and Behrman, 2013). The effect of adequate dietary diversity is well documented in the literature. Several studies describe the positive health consequences of dietary diversity (Steyn et al, 2014; Frempong and Annim, 2017; Ahazmi et al, 2014; Conklin et al, 2016). Studies by Sraboni et al (2014) and Tanankem et al (2016) showed that women empowerment directly improved levels of dietary diversity and levels of nutrition.

Findings

The analysis of the Dietary Diversity of South Africans is based on the General Household survey 2018, of 21908 households. By calculating the Dietary Diversity Score as explained in the methodology section, a mean score of 6.93 is recorded, with a minimum score of 1 and a maximum score of 10, with a standard deviation of 1.9744. The descriptive statistics of the sample shows 8960 (42.9%) households were headed by a

female head of household and 11948 (57.1%) households were headed by a male head of household. This is expected especially where the man in the house is considered the head even in circumstances where the income earner is the female. Based on the measurement of dietary diversity as indicated in the methodology, 1326 households, or 6.3 % of households can be considered as households with a low dietary diversity. A total of 10540, or 50.4 % of the households can be considered as households with a moderate dietary diversity, while 9042, or 43.2 % of households can be considered as households with a high dietary diversity. The Dietary Diversity categories of the households are shown in Table 1. Cumulatively 56.8 % of households fall into the moderate to low dietary diversity category.

Table 1
Categories of Dietary Diversity

	Frequency	Percentage	Cumulative Percentage
Low diversity	1326	6.3	6.3
Moderate diversity	10540	50.4	56.8
High diversity	9042	43.2	100.0
Total	20908	100.0	

Source: Author's own calculations

By calculating the poverty status of households, using the lower bound poverty line (Statistics South Africa uses three poverty lines, namely, the food poverty line, the lower bound poverty line and the upper bound poverty line) households were categorised as poor or non-poor. In this context 15771, or 75.4% of the sample could be classified as non-poo and, 5137, or 24.6% of the households could be classified as poor. The poverty distribution in the sample is shown in Table 2.

Table 2
Poverty Status Distribution in the Sample

	Frequency	Percentage	Cumulative Percentage
Non poor	15771	75.4	75.4
Poor	5137	24.6	100.0
Total	20908	100.0	

Source: Author's own calculation

Based on the categorised DDS, a cross tabulation was done with gender and the results are presented in Table 3. The Pearson Chi Square test statistic was 21.602 with a p-value of 0.000 indicating that there was a significant difference in the dietary score between males and females. The results in Table 3 show that in the low dietary diversity category, 40.6 % are female headed households whilst 59,4 % are male headed households, implying that male headed households are eating less groups of food compared to female counterparts. The trend however is the same in the moderate and the high diversity. Within the gender, 6.6% of the male headed households are in the lower diversity, 49.0% in the moderate and 44.4 % in the high diversity category. This implies that the majority of the male headed households are in the moderate diversity group. In the case of female headed households, the majority of households are in the moderate diversity with 52.3 % falling in that category, compared to 49.0% of male counterparts.

Table 3
Gender and Dietary Diversity Score Cross Tabulation

		Dietary Diversity Category			
		Low diversity	Moderate diversity	High diversity	Total
Female	Count	538	4682	3740	8960
	% within Gender	6.0	52.3	41.7	100.0
	% within Dietary diversity category	40.6	44.4	41.4	42.9
Male	Count	788	5858	5302	11948
	% within gender	6.6	49.0	44.4	100.0
	% within Dietary diversity category	59.4	55.6	58.6	57.1
Total	Count	1326	10540	9042	20908
	% within gender	6.3	50.4	43.2	100.0
	% within Dietary diversity category	100.0	100.0	100.0	100.0

Source: Author's own calculations

Table 4 presents the regression results of the OLS model. The dependent variable was the dietary diversity score. The results of the regression model show an F statistic of 128 and a p-value of 0.000 which indicated that the model as a whole is significant in explaining the variation in the dietary diversity score of households. The regression results in Table 4, shows that age of the head of the household, has a positive relationship with Dietary Diversity, and is statistical significant at the 1% level. Household size shows also a positive relationship with dietary diversity and is statistical significant at the 1% level. Log of income also has a positive relationship with Dietary Diversity, with statistical significance at the 1% level. The coefficient for gender although negative, is not significant in explaining the variation in the Dietary Diversity with a p-value of .712. Poverty status was significant at 1% level of significance (p-value .000). The dummy for poverty status was defined as 1 for poor and 0 for non-poor. Thus, the negative coefficient indicates that poor households have a lower dietary diversity score compared to the non-poor households.

Table 4
Regression Results

	Unstandardized Coefficients		Standardized Coefficients		
Model	*B*	Std. Error	*Beta*	*t*	*Sig.*
(Constant)	6.170	.082		75.673	.000***
Age of household head	.008	.001	.062	8.755	.000***
Household size	.078	.006	.093	12.132	.000***
Log of income	.033	.006	.040	5.242	.000***
Gender (1=Male)	-.010	.028	-.003	-.369	.712
Poverty Status (1= poor)	-.690	.039	-.150	-17.909	.000***

Dependent Variable: Dietary diversity Score (DDS)
*** *significant at 1%, ** Significant at 5% * significant at 10%*

Discussion

With regards to dietary diversity 56.8% of South African households who took part in the survey ate less than 6 food groups, in the last 24 hours. A total of 1326 households or 6.3% ate less than 3 food groups. This is associated in the literature with negative health consequences. Aligned with the studies of Shariff et al (2015); Salois et al (2012); and Huang and Tian (2019), this study found that income is a significant contributor towards dietary diversity. In this context this study found that poor households may be prone to lower levels of dietary diversity from an access perspective. This is in line with the study of Huang and Tian (2019). Similar to the study of Tian and Yu (2015) this study found that as income increase staple food is replaced by animal meat and other food groups. This study found that poor households in low income neighbourhoods may be associated with lower dietary diversity. Aligned with international literature (Moon et al, 2002; Woldehanna and Behrman, 2013), this study found household size as a statistical significant contributor towards higher levels of dietary diversity. Contrary to studies by Sraboni et al (2014) and Tanankem et al (2016) that showed that women empowerment directly improved levels of dietary diversity, gender was not a statistical significant contributor towards dietary diversity in the model.

Limitations

A limitation of the study is the measurement of Dietary Diversity. As Drescher et al (2007) indicates "one limitation of the count measure is that no weights are attached to food items belonging to different food groups since each food item has a different nutritional content. In this study this could not be accounted for based on the types of questions on dietary Diversity in the General Household Survey.

Recommendations

It is recommended that policy makers should take note of the proportion of citizens, consuming less than 6 food groups. As a proxy of food insecurity this may be important in policy making exercises. In this context poverty can be seen as an important determinant impacting on dietary diversity at the household level.

Conclusion

In this paper the Dietary Diversity Index and impact of socio economic determinants in the South African context. The results showed an uneven distribution of dietary diversity in the South African context, from an economic development perspective, with a large proportion of citizens consuming less than 6 food groups in terms of dietary intake. Aligned with international literature policy makers should take note of Dietary Diversity as a proxy for food insecurity. In this regard Dietary Diversity may give a better indication of food insecurity in a country. A focus on Dietary Diversity may be important from a health perspective in National Health Policy determination.

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