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Socio Economic Determinants of Household Dietary Diversity in a Low Income Neighbourhood in South Africa

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Rapid Urbanisation can be considered as the root cause of an 'invisible crisis' of urban food security. By 2030, most of Africa's population will reside in urban areas, and South Africans will be no exception. Food security in this regard is a state in which all people at all times have both physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life. Food insecurity on the household level has severe implications for nutrition, and households that fail to obtain nutritious food may develop multiple chronic health problems. Food insecurity and limited dietary diversity may also result in poor physical and mental health. In sub-Saharan Africa, the percentage of malnourished people is estimated to have risen from 17 percent in 1990 to 27 percent in 2011. Dietary diversity scores are being used increasingly as measures of food security and as proxies for nutrient adequacy. This study examines the relationship between dietary diversity scores and socio economic variables in a low-income neighbourhood in South Africa. The study intends to answer the question: To what extent do socio economic factors determine dietary diversity in low-income neighbourhoods. A quantitative research method was deployed and a stratified random sample of 600 was undertaken in Sharpeville and Bophelong, low-income neighbourhoods in South Africa, to determine the dietary diversity of food secure versus foods insecure households. Multiple regressions were used to determine the effects of socio economic characteristics, on the dietary diversity scores of households. The dietary diversity scores were then considered as the outcome variable and socio economic variables as predictors. The study concluded that marital status, employment status, age, gender, household income and expenditure on food predict dietary diversity on the household level. The recommendation is that government must focus on urban food insecurity separately, with a more comprehensive strategy.

Keywords: Food Security, Dietary Diversity, Poverty, Urbanisation, Economic Development, Sustainable Development

1. Introduction

Food insecurity in the context of adequate nutrition can be defined as "when the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain (Anderson, 1990). In severe cases of household food insecurity with hunger, Lenhart and Read (1989) describe food insecurity as "a condition resulting from chronic under-consumption of food and/or nutritious food products". Although food insecurity measures do not measure nutritional deprivation or inadequate intake, there is consensus that chronic food insecurity leads to malnutrition over time (Dietz and Trowbridge, 1990; Hampton, 2007; Mello et al, 2010; Nord and Parker, 2010). Food security entails availability, access and utilisation of food to ensure optimum health (Ajani, 2010).

Dietary diversity can be defined as "the number of different foods or food groups consumed over a given reference period" (Ruel, 2002). Dietary diversity can be linked to access, availability and utilisation of food (Steyn et al, 2006; Hillbruner and Egar, 2008).

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Dietary guidelines recommend eating a variety of foods, across and within major food groups (Jeanene et al, 2006). Dietary diversity is related to food security and it may be necessary to understand dietary diversity in the context of food insecurity for effective and efficient policy interventions. Rashid et al (2006), in this regard, indicate that most studies focus on quantity of food intake, rather than quality of food intake.

Studies have linked household dietary diversity to improved nutrient intake in developing countries (Arimond and Ruel, 2004; Savy et al, 2005; Steyn et al, 2006). A positive link exists between dietary diverse food intake and food security. As households become more food secure they can consume more healthy foods (Thorne-Lyman et al, 2010). Higher household food security is associated with more diverse dietary intake. Hoddinott (2002) see nutrient adequacy as an outcome of food security. Thus, dietary diversity can be seen as a predictor of household food security status (Thorne-Lyman et al, 2010).

Researchers indicate that food insecurity will most likely occur in low-income areas (Furness et al, 2004; Mello et al, 2010; Nord and Parker, 2010). This study intends to analyse dietary diversity in two low-income areas, namely Bophelong and Sharpeville, in the Sedibeng area, Gauteng province, South Africa. This study aimed to increase the general understanding of food insecurity in low-income areas, and the determinants of dietary diversity in the context of food insecure households. The study thus analyses the socio-economic determinants that contribute to higher dietary diversity in low-income households. The questions arise: Which socio-economic household characteristics leads to lower dietary diversity? To what extend do limited income lead to lower diversity and/or quality food intake?

The study is outlined as follows. Section 2 provides a literature review on the measurement of dietary diversity and socio economic determinants of dietary diversity. Section 3 discusses the methodology followed in the study. Section 4 discusses the findings, and finally, the last section draws a conclusion.

2. Literature review

Food insecurity includes challenges faced by individuals and households with quantity of food intake, quality of food intake, uncertainty about quantity of food availability, and food experiences such as anxiety about food access (Kendall et al, 1996). Limited access to food (example: limited income) normally leads to reduced expenditure on more expensive higher quality foods, with higher nutritional value (Dachner et al, 2010; Bloem et al, 2005). Poor dietary quality intake is a significant contributor to under-nutrition (Steyn et al, 2006). The outcome of food insecurity at the household level, thus first is limited intake of quantity food and secondly, a reduction in the quality food intake (Kendall et al, 1996; Rose, 1997). Lower quality food intake is associated positively with increased health risks such as obesity and certain chronic diseases (Blackburn et al, 1989; Alaimo et al, 2001; Bronte-Tinkew et al, 2007; Hampton, 2007).

The measurement of dietary diversity has gained increased attention from researchers (Ruel et al, 2002; Arimond and Ruel, 2004; Hodinott, 2002; Ruel et al, 2004). Dietary diversity is measured by summing the number of food groups consumed over a specific reference period, for example in the last 24 hours (Ruel, 2002; Vakili et al, 2013).

With regard to socio-economic household characteristics, researchers suggest that a positive relationship exists between household income and dietary diversity (Theil and

Finke, 1983; Regmi, 2001; Rashid et al, 2006). With regard to education, age of head of household, household size, gender and employment status, previous studies suggest positive correlations with dietary diversity (Thiele and Weiss, 2003; Thorne-Lyman et al, 2009; Taruvinga et al, 2013). A study by Rogers (1996) found that female-headed households spend more on higher quality food. Several studies show a positive relationship between level of education and higher dietary diversity (Smith and Haddad, 2000; Smith et al, 2003). The literature, however, focuses more on rural household dietary diversity then dietary diversity in urban households. The next section discusses the background of the study area.

3. Research methodology and data

3.1 Background of the study area

This study was conducted in two low-income neighbourhoods, Bophelong and Sharpeville in the Emfuleni municipal area, southern Gauteng, South Africa. The area consists of six semi-urban low-income areas, namely Evaton, Sebokeng, Sharpeville Boipatong, Bophelong and Tshepiso. Bophelong and Sharpeville were selected randomly to be sampled. The total population of the Emfuleni municipal area is 721,633. The population of Bophelong is 37,779 and the population of Sharpeville is 41,031. The number of households in Bophelong is 12,352 and the number of households in Sharpeville is 8,374 (Stats SA, 2011). The number of poor households in Bophelong is 8152, compared to 3609 households in poverty in Sharpeville (Stats SA, 2011).

3.2 Methodology

Sample and data collection

A stratified sample of households was drawn and every second household was sampled to be interviewed. Only the head of each household was interviewed. Both male and female households were interviewed. A total of 600 households were interviewed by fieldworkers. Fieldworkers were trained specifically to prompt heads of households with regard to dietary diversity in the last 24 hours. Fieldworkers proficient in African languages as well as English collected the data. Participants were under no obligation to participate.

Measuring instrument

The 24-hour dietary recall scale of the Food and Agricultural Organization (FAO, 2007) was used to determine the Household Dietary Diversity Score (HDDS) of households. One point per food group recalled in the last 24 hours was recorded. A scale of 12 food groups shown in Table 1 was used. The maximum score per household was a score of 12 points, and the minimum score zero. Table 1 shows the categories of food groups used to determine the household dietary diversity score.

Table 1: Food group categories used in the calculation of dietary diversity

	Food Group	Point allocation
1	Any bread, rice, noodles, biscuits or food made from millet, sorghum, maize, rice, wheat or any other locally available grain	1
2	Any potatoes, yams, manioc, cassava or any food made from roots or tubers	1
3	Any vegetables	1
4	Any fruits	1
5	Any beef, pork, lamb, goat, rabbit, wild game, chicken, duck, other birds, liver kidney, heart or other organ meats	1
6	Any eggs	1
7	Any fresh, dried fish or shellfi	1
8	Any foods made from beans, peas, lentils or nuts	1
9	Any cheese, yoghurt, milk or other milk products	1
10	Any foods made with oil, fat or butter	1
11	Any sugar or honey	1
12	Any other foods such as condiments, coffee or tea	1
		12

Model

A multiple linear regression model was used to determine which socio-economic variables predict dietary diversity at the household level. The HDDS was calculated as a continuous variable from zero to 12 per household and seen as the dependent variable. Household size, age of head of household, marital status of head of household, employment status of head of household, income of head of household, education of head of household and expenditure on food and other expenditure were estimated as predictor variables.

The linear regression model is specified as follows:

$$HDDS_i = \beta_0 + \beta_1 HHSize_i + \beta_2 AgeH_i + \beta_3 GenderH_i + \beta_4 MaritalS_i + \beta_5 EmployS_i + \beta_6 Log\ IncomeH_i + \beta_7 YearsSH_i + \varepsilon_i$$

Table 2 provides an explanation of the variables in the linear regression model.

Table 2: Variable description

Variables	Description
HHSize	Household size
AgeH	Age of household head
GenderH	Gender of household head(0= male, 1 =female)
MaritalS	Marital status of head of household (0 = married, 1 = unmarried)
EmployS	Employment status of head of household (0 = employed, 1 = unemployed)
YearsSH	Years schooling of head of household
IncomeH	Income of household

Source: Own description

4. Findings and interpretation

4.1 Demographic characteristics of respondents

The sample data were based on responses from heads of households. A sample of 600 household heads was interviewed, and after cleaning data, 580 household's data were analysed. Table 3 below provides a description of the descriptive statistics of the sample. The average household size of the households in the sample is 4.16 households, with a maximum number of members per household of 11. The mean age of the head of the household in the sample is 49.47 years, with a minimum age of 22.0 and maximum age of 83.00, and standard deviation of 13.8 years. The average number of years schooling of the head of the household in the sample is 9.49 years equivalent to secondary school. The average income per household is R 7254.51, with a maximum income of R 35000.00 and a minimum of R 320.00, with a standard deviation of R 5916.49. The average household expenditure is R 5324.60, with a standard deviation of R 4720.35. The minimum household expenditure in the sample is R 305.00. Households in the sample spend on average R 1203.80 on food, while the minimum expenditure is R 95.00.

Table 3: Descriptive statistics of the sample

Variable	N	Min	Max	Mean	Std. Dev.
Household size	580	1.00	11.00	4.167	1.662
Age of head of household	580	22.00	83.00	49.474	13.803
Number of years schooling	580	0.00	15.00	9.498	3.630
Household income	580	350.00	35000.00	7254.541	5916.491
Household expenditure	580	305.00	19900.00	5324.641	4720.352
Household food expenditure	580	95.00	5870.00	1203.842	672.761
HDDS	580	2.00	12.00	8.575	2.699

4.2 Food spending patterns of respondents

The average dietary diversity score of households, in the sample are 8.57. If scores below eight are considered low dietary diversity scores, and scores above eight are considered high dietary diversity, the sample can be divided between households with high dietary diversity and households with low dietary diversity. In this regard 353 households fall into the high dietary diversity category and 227 households fall into the low dietary diversity category. High dietary diversity household's spending on all 12 groups were higher than low dietary diversity households, except oils, fats and butter

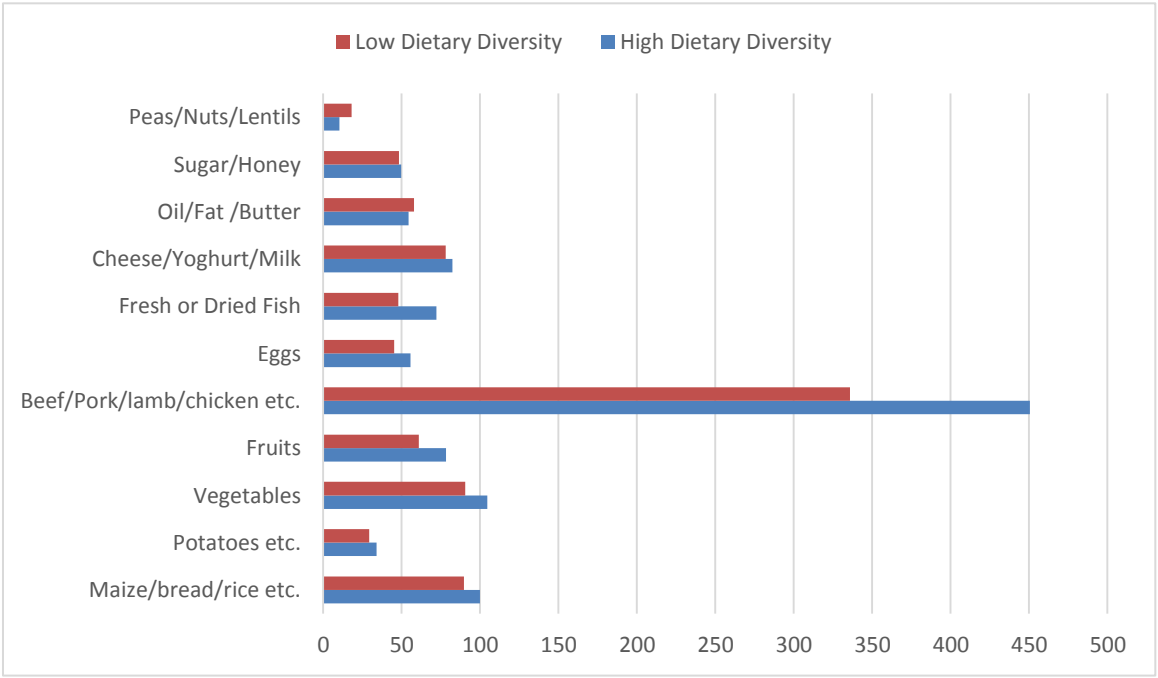
Table 4: Food spending patterns of high dietary diversity households compared with low dietary diversity households

Food Group	Diversity cat.	N	Mean	Std. Dev.	Std. err.
Maize, rice, bread etc.	High Diversity	353	100.08	47.63	2.53
	Low Diversity	227	89.82	39.84	2.64
Potatoes or roots etc.	High Diversity	353	34.07	29.01	1.54
	Low Diversity	227	29.43	21.91	1.45
Vegetables	High Diversity	353	104.71	86.44	4.60
	Low Diversity	227	90.60	73.06	4.84
Fruits	High Diversity	353	78.28	89.46	4.76
	Low Diversity	227	61.05	73.99	4.91
Beef, pork, lamb, chicken etc.	High Diversity	353	450.48	333.81	17.76
	Low Diversity	227	335.95	222.71	14.78

Eggs	High Diversity	353	55.75	47.77	2.54
	Low Diversity	227	45.32	26.28	1.74
Fresh or dried fish	High Diversity	353	72.22	126.56	6.76
	Low Diversity	227	47.88	62.18	4.12
Beans, peas, lentils or nuts	High Diversity	353	78.23	66.13	3.51
	Low Diversity	227	82.55	61.08	4.05
Cheese, yoghurt, milk, milk products	High Diversity	353	18.34	21.42	1.14
	Low Diversity	227	10.14	7.78	4.69
Oil, fat or butter	High Diversity	353	54.50	34.93	1.85
	Low Diversity	227	57.91	53.34	3.54
Sugar or honey	High Diversity	353	49.73	60.29	3.20
	Low Diversity	227	48.38	34.07	2.26

The mean expenditure on meat of high dietary diversity households is R 450.48 (standard deviation of R 333.81) compared to R 335.95 (standard deviation of R 222.71) of low dietary diversity households. Low dietary diversity households spend considerably less on fruit and vegetables (R 61.05 and R 90.60) compared to high dietary diversity households (R 78.28 and R 104.71). Figure 1 below show the spending on food by high dietary diversity households compared to low dietary diversity households.

Figure 1: Spending patterns on food groups (high dietary diversity compared to low dietary diversity)



4.3 Analyses of determinants of household dietary diversity

Table 5 shows the results from the linear multiple regression model. The HDDS of the households were used as dependent variables. Household size, age of head of household, gender of head of household, marital status of head of household, employment status of head of household, years schooling of head of household and household income were used as predictors of household dietary diversity in the model. The model was significant at the 0.01 level explaining dietary diversity of households. The F value of 123.24 is significant in the model ($p< 0.001$). The Durbin-Watson statistic at 1.752 shows that the assumption in the model of independent errors is tenable. The adjusted R^2 value of 0.601 indicates that 60.1 percent of the variance in dietary diversity of households can be explained by household size, age of head of household, marital status, employment status, income of head of household and the number of years schooling of the head of the household. Collinearity diagnostics of the model shows an average VIF of 1.26 confirming that collinearity is not a problem in the model (average VIF value near 1). Tolerance values in the model were all above 0.2 and no VIF values were greater than 10. A plot of residuals shows that assumptions of linearity are not broken and, therefore, heteroscedasticity and non-linearity are not a problem in the model.

The coefficient for household size in the model is negative meaning that an increase in household size will decrease household dietary diversity. Household size in the model is a significant predictor ($t=-1.747$, $p<0.1$), meaning that it contributes significantly towards explaining food insecurity in the model, at the 0.1 level. Gender of the head of the household was significant ($p<0.1$), and the coefficient of the predictor shows that female-headed household's dietary diversity will be higher than male headed households will ($t=1.663$, $p < 0.1$). The coefficient for marital status is negative ($t=-3.079$) meaning being married increases the probability dietary diversity on the household level. Marital status as predictor were significant ($p< 0.01$), in explain the model. Employment status was significant at the 1 percent level ($t= -10.655$, $p<0.001$), with a negative coefficient (0 = employed, 1 = unemployed) meaning that being employed increase dietary diversity at the household level. Household income was a significant predictor at the 1 percent level ($t=10.913$, $p<0.001$), with a positive coefficient meaning that higher income increases dietary diversity at the household level. The number of years schooling of the head of the household was not significant ($p>0.1$) in predicting dietary diversity, however the positive coefficient ($t= .394$) indicate that schooling impact positively on dietary diversity.

Table 5: Determinants of Household Dietary Diversity

Model	B	Std. error	β	t	Sig.
(Constant)	-2.007	1.084		-1.851	.065
HHSize	-.082	.047	-.050	-1.747	.081***
AgeHead	.005	.007	.026	.785	.433
GenderH	.259	.156	.048	1.663	.097***
MaritalS	-.533	.173	-.097	-3.079	.002**
EmployS	-2.185	.205	-.401	-10.655	.000
YearsSH	.011	.027	.014	.394	.693
IncomeH	1.357	.124	.425	10.913	.000*

*Significant at 0.01 level

**Significant at 0.05 level

***Significant at 0.1 level

F value significant at 0.01 level

F value = 123.240

R^2= .601
Durbin Watson = 1.752

5. Conclusion

This paper estimated the determinants of household dietary diversity in urban areas, using socio economic data gathered from 600 households in two low-income urban areas, in South Africa. The results show the critical role that employment status, and income plays in urban areas, to secure food security and high dietary diversity levels at the household level. The results show that marital status impact positively on dietary diversity at the household level. In line with similar studies, the results show that female-headed households tend to be higher in dietary diversity than male headed households. Policy initiatives in urban areas should be directed towards employment creation, as well as skills development to unlock the potential of households to increase income. Social security programs should be directed towards food expenditure, to ensure a higher level of dietary diversity at the household level. Government should reconsider policies in South Africa directed towards food security. Government should consider conditional cash grants directed towards food expenditure. As results show, income is a major contributor towards, food security and higher dietary diversity at the household level in, urban low-income areas.

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