Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.70, 2017

The Relationship between Household Food Entitlements and Dietary Adequacy among Children (6-59 Months) in Gulu District, Uganda

Ikwayo Ivan
Department of Food Technology and Nutrition,
College of Agricultural and Environmental Sciences, Makerere University, Kampala – Uganda
Doctors with Africa CUAMM, Uganda

Acham Hedwig*
Department of Food Technology and Nutrition,
College of Agricultural and Environmental Sciences, Makerere University, Kampala – Uganda

The research was funded by NOMA scholarship program under the Norwegian government

Abstract
Inadequate provision of food entitlements for subsistence is one of the causes of hunger, starvation and poor nutrition. The relationship between household food entitlements and dietary adequacy for Protein, Iron and Vitamin A; and dietary diversity of children (6-59 months) was investigated in two different food entitlement households including 'own production' and 'food purchase' (n=371). The mean dietary diversity scores (3.27±0.96 and 3.58±1.05) differed significantly in the respective food entitlement households ($p<0.05$). The nutrient adequacy ratios (NAR) for Protein, Iron and Vitamin A (2.38±1.50 and 2.20±1.40; 0.92±0.95 and 0.84±0.64; 0.34±0.66 and 0.36±0.50; respectively) did not significantly differ ($p>0.05$). Household food entitlements affect dietary diversity of children 6-59 months, with dependence on food purchase being associated with a more diverse diet.
Keywords: Food entitlements, Dietary Adequacy, Dietary Diversity, Gulu District.

1.0 Introduction

Within the confines of nutrition, food entitlements, referring to the sources of access and availability to food (Bokeloh, 2005); describe all legal sources of food, of which if not adequately provided may lead to hunger, starvation and poor nutrition. In an economy with private ownership and exchange in the form of trade and production, the food entitlement set depends on the endowment of the person (ownership bundle) and the exchange entitlement mapping through which they can; produce their own food, buy food in exchange of commodities and cash owned, exchange their labour power for wages or food, and own what is willingly given to them by a legitimate owner (transfers) (Sen, 1981).

United Nations Food and Agricultural Organization (FAO, 2013), reported that the food supplies in Uganda stood at 2,190 Kcal per caput/day, adequate to provide everyone with all the 2,100 Kcal needed for an active and healthy life if the food were equally distributed. However the inequality in distribution has resulted in 42% of the population being food insecure and the country still being considered a high burden malnutrition country, with the highest prevalence of malnutrition and food insecurity being experienced in the Northern part of the Country. Northern Uganda experienced over 20 years of protracted armed insurgency that led to displacement of over 1.6 million persons (Kashyap et al., 2004) and disruption of livelihoods resulting in unfavourable shifts in food entitlements. In Gulu district agricultural production declined with an estimated 80% of the farming households unable to produce. Similarly, trade based food entitlements were also affected as the restricted movement of goods (including food) rendered markets dysfunctional, limiting food varieties and quantities in the markets, resulting in price increases. Decline in agricultural production also resulted in failures of labour-based food entitlement as many who relied on agriculture for employment were rendered unemployed. Majority (1.6 millions) of the population therefore relied on food transfers (General Food Distribution -GFD) by the United Nations World Food Programme (WFP) to meet their dietary needs. The GFD ration were inadequate, with a dietary diversity score of 3, and designed to meet only 67-80% of the Recommended Dietary Allowance (RDA) (Kashyap et al., 2004). According to WFP (2006), majority of households in Acholi were food insecure with 49.3% having poor consumption, 24.0% having border line consumption, 15.1% having good consumption and 11.6% having very good consumption. Additionally, UBOS (2007) reported a malnutrition rate of 40.0% stunting, 21.8% underweight and 6.5% wasting compared to national levels of 38.0, 16.0 and 6.0% for stunting, underweight and wasting; respectively.

However with the cessation of hostilities, there have been shifts in food entitlements from the largely transfer based food entitlement to either own production, trade, and labour based entitlements. By 2011; 63% and 33% of the households in Gulu district relied on own food production and food purchases (markets);

respectively, to meet their dietary needs (Action Contre la Faime (ACF, 2011). Northern Uganda (except Karamoja sub-region) saw an improvement in the food security situation from acute food crisis (Phase 3) during the peak of the insurgency to borderline food insecurity (Phase 1) in 2013 (FEWSNET, 2013). However, despite the shifts, no attempt has been made to understand how dependence on the different food entitlements has affected dietary adequacy in households in Gulu district. The aim of the current study was to compare dietary adequacy in households dependent on food purchase with those on own food production entitlements, specifically focusing on Dietary Diversity, Protein, Iron and Vitamin A adequacy for children 6-59 months. These are some of the most common indicators used to assess nutritional adequacy and change among individuals, most importantly children 6-59 months. Additionally, demand for more safe, high quality food is now on the rise, with more people buying food from retailers instead of producing (or in addition to) growing and consuming their own crops. This shift presents an opportunity for smallholder farmers to participate in modern food production and help meet the growing demands. This research therefore has been a step towards informing policy and motivating changes in production, diet quality and consumption.

2.0 Materials and Methods

2.1 Study area and design

The study was conducted in Gulu District (Omoro County and Gulu Municipality), Northern Uganda where an estimated 70 percent of the households were reported to be actively involved in agriculture. The study was cross sectional in design and comparative, the two arms including; children 6-59 months from households that depended on own food production and those from households that depended on food purchase for meeting their household dietary needs.

2.2 Study population

Data was collected from primary caretakers of children (6-59 months) in the two categories of households. Categorization was done based on the estimated cumulative contribution (expressed as percent) of the various food acquisition methods (including; own food production, food purchase and food transfers) to the total household food supply using proportional piling methodology. Only foods that were consumed at least once a month were considered in this categorization. Households with at least 50 percent of the foods being derived from either of the acquisition methods were categorized as belonging to that particular food entitlement category. The food groups including oils and fats; sweets; and spices, condiments and beverages were excluded from the calculation of their relative contribution to household dietary consumption because they are purely derived from market sources, implying that all households irrespective of the entitlement category have limited choices on the modes of their acquisition.

2.3 Sampling

A total of 371 households were sampled following a multistage sampling procedure (Figure 1). The first stage of sampling was at the County level where 2 of the 3 counties (Aswa, Omoro and Gulu Municipality) that constitute Gulu District were selected. Out of the three, the more urbanized municipality (Gulu municipality) was purposively selected while the other (Omoro County) was randomly (by lottery) chosen from the remaining two rural Counties. The second stage of sampling was conducted at Sub County level where Pece Division was randomly selected from among the four (4) Divisions that constitute Gulu Municipality; and Odek Sub County was randomly (by lottery) selected from among the six (6) Sub Counties that constitute Omoro County. Stage three of sampling was household selection, where systematic random sampling was conducted to select households (n=371) that were categorized as either dependent on food purchase or own food production, and had at least one child aged 6-59 months. In total, 371 Households were recruited to participate in the study. Sample size was determined following the Cochran (1963) formula.

2.4 Measurement methods

Food consumption data was collected through an interviewer administered single 24 hour recall standard questionnaire, from which dietary adequacy was assessed (as DD, NAR and MAR).

i) Dietary diversity (DD); was measured by summing up the number of the different food groups consumed over a 24 Hour period. A score of 1 was awarded if any foods irrespective of the quantity was eaten from any given food group. If no food was eaten from a particular food group within the reference period, a score of 0 was awarded. A seven food group classification recommended for children 6-59 months (WHO, 2008) was used for the assessment of DD. The cut-off point of at least 4 of the 7 food groups was used to define the state of DD because it has been found associated with better quality diets for both breastfed and non-breastfed children (WHO, 2008). A The food groups considered were Grains, roots & Tubers; Legumes &Nuts; Dairy products (Milk, Yoghurt, Cheese); Flesh foods (Meat, Fish, poultry & Liver/organ meats); Eggs; Vitamin A rich fruits & vegetables; and other fruits and vegetables).

ii) Nutrient Adequacy Ratios (NAR); was measured by dividing the total computed nutrient intake from the various foods consumed by the age and sex specific nutrient recommended dietary allowance for the individual (by age and sex category). NAR was truncated at 1as recommended by (Hatloy et al., 1998) so that a nutrient with a high NAR does not compensate for a nutrient with a low NAR.

A cutoff of point of equal or greater than 0.77 of the NAR was used to classify intake as adequate, following Simko et al., (1995).

iii) Mean Adequacy Ratio (MAR); was measured by summing up the nutrient adequacy ratios (NAR) for nutrients; Protein, Iron and Vitamin A (truncated at 1) then divided by 3 (the number of nutrients of concern).

2.5 Data analysis

Statistical Package for Social Scientists (SPSS) version 20 and Microsoft Excel (2013) were used for analysis and presentation of data. Univariate analyses were done to get summary statistics (frequencies, means and SD) of variables investigated. Nutrient compositions were calculated manually using the Harvest Plus (2012) Food Composition Table for Uganda. Comparisons between groups was done using the student's t-test for normally distributed continuous variables, and Chi-square tests for categorical data.

3.0 Results

3.1 Demographic characteristics within entitlements

3.1.1 Age and sex distribution

Of the 371 sampled children, 49.3% were male while 50.7% were female. The mean age was 32.92±13.80 months (33.13±13.75 and 32.75±13.87 for children in the own food production dependent and food purchase dependent households respectively). The age and sex distribution across the food entitlement categories were not significantly different (p>0.05) (Table 1).

Table 1: Descriptive age statistics of sampled children (6 – 59 months) within entitlements (n=371)

Household food entitlement	Mean ages (months) of children	Std. Deviation	95% C.I for mean	
			Lower Bound	**Upper Bound**
Own production	33.1	13.75	31.00	35.26
Purchase	32.7	13.87	30.83	34.67
Total	**33.0**	**13.80**	**31.50**	**34.33**

3.1.2 Breast feeding status of sampled children

The majority (78%) of the sampled children were not breastfeeding (Table 2) at the time of the study. WHO & UNICEF (1990) recommend continued breastfeeding up to 24 months of age or beyond. According to UBOS (2012), the median duration of breastfeeding in Northern Uganda was 21.4 months. A comparison between breastfed and non-breastfed children across the entitlement categories was not significantly different (p>0.05). The high proportion of non-breastfed children in this study underscores the importance of family diets to the overall nutritional status of the children as 100% of their RDA has to be derived from family foods.

Table 2: Breastfeeding status of sampled children (by number and percent) (n=371)

Breastfeeding status	Household food entitlement category		TOTAL (n=368)
	Own production dependent (n=163)	**Purchase dependent (n=205)**	
Yes	37 (22.7)	44 (21.5)	81 (22.0)
No	126 (77.3)	161 (78.5)	287 (78.0)

3.2 Dietary Adequacy

3.2.1 Dietary Diversity

The overall mean dietary diversity score was 3.4±1.0 (3.28±0.96 and 3.58±1.05 in the own production and food purchase dependent households; respectively). (Table 3). Based on the World Health Organization (WHO, 2008) cutoff point of 4 for adequate DD, about 50% of the children had adequate diets (Figure 2).

Table 3: Diversity of children's diets (n=371).Figures presented are for mean consumption with 95% CI for the Mean.

Variable	**Household food entitlement**	**Mean (±SD)**	**95% C.I for Mean**		**Max**
			Lower Bound	**Upper Bound**	
Dietary Diversity	Own production	3.28 (±0.96)	3.13	3.43	5.00
	Purchase	3.58 (±1.05)	3.43	3.72	7.00
	Total	**3.44 (±1.02)**	**3.34**	**3.55**	**7.00**

Plant based foods were highly consumed with the most being from the food group of grains, roots and

tubers (97.3 %). Animal source foods were generally consumed in low proportions, the flesh foods being consumed relatively highly (26.4%) compared to others in the group; while egg group had the lowest consumption rate (2.9%) (Figure 3).

Overall, there was a significant relationship found between levels of dietary diversity and sex of household heads (p=0.004). When disaggregated, a higher proportion of children in the female headed households were found to consume a more diverse diet compared to those in the male headed households (49.7% and 45.1%; respectively) (Table 4).

Table 4: Relationship between dietary diversity and sex of household heads (percent).

Variable	Levels of DD	HH food entitlement category		Total	Pearson X^2	Asymp Sig. (2-sided)
		Own production (%)	Purchase based (%)			
Sex of household head						
Male	Low	55 (65.5)	58 (47.5)	113 (54.9)	6.46	0.011
	High	29 (34.5)	64 (52.5)	93 (45.1)		
	Total	**84 (40.8)**	**122 (59.2)**	**206 (100.0)**		
Female	Low	45 (57.0)	38 (44.2)	83 (50.3)	2.69	0.101
	High	34 (43.0)	48 (55.8)	82 (49.7)		
	Total	**79 (47.9)**	**86 (52.1)**	**165 (100.0)**		
TOTAL	Low	100 (61.3)	96 (46.2)	196 (52.8)	8.46	0.004
	High	63 (38.7)	112 (53.8)	175 (47.2)		
	Total	**163 (43.9)**	**208 (56.1)**	**371 (100.0)**		

However, a non-significant relationship (p>0.05) was observed between the proportion of children who consumed adequately diverse diets (DD>4) and the education level of the household head, although the proportion was seen to improve with increasing education level (Figure 4).

3.2.2 Nutrient Adequacy Ratio

Overall, the mean NAR for Protein was 2.28±1.44; (2.38±1.50 and 2.20±1.40, for own food production and in the food purchase dependent households; respectively). Additionally, the mean NAR for Iron was 0.88±0.79 (0.92±0.95 and 0.84±0.64, for own food production and food purchase dependent households; respectively). Finally, the mean NAR of Vitamin A was 0.35±0.57 (0.34±0.66 and 0.36±0.50, for own food production and food purchase dependent households; respectively) (Table 5). The overall MAR of the diets (Protein, Iron and Vitamin A) was 0.64±0.20 (0.64±0.21 and 0.64±0.20 for own food production and food purchase dependent households; respectively). The differences in MAR of the diet, NAR for Protein, Iron and Vitamin A were however not significant in the different entitlement categories (p>0.05).

3.2.3 Mean Adequacy Ratio (MAR)

Considering the MAR of the diet and following the cutoff point of 77% of the RDA for determination of adequacy, just about one quarter of the children (26.8% and 24.1% in own food production and food purchase dependent households; respectively) met the requirement for adequacy (Figure 5). The NAR values of individual nutrients, indicated that majority of the children had an adequate Protein intake (89.2% vs 86.6% for food purchase and own production dependent households; respectively) Figure 5. The difference was not however significant (p>0.05).

Table 5: Nutrient adequacy ratios and Mean adequacy ratios of the diets.

VARIABLE	Household food entitlement	Mean (SD)	Range
NAR-Protein	Own production	2.38 (±1.50)	2.14 - 2.61
	Purchase	2.20 (±1.40)	2.01 - 2.39
	Total	**2.28 (±1.44)**	**2.13 - 2.43**
NAR-Iron	Own production	0.92 (±0.95)	0.78 - 1.07
	Purchase	0.84 (±0.65)	0.75 - 0.93
	Total	**0.88 (±0.79)**	**0.79 - 0.96**
NAR-Vitamin A	Own production	0.34 (±0.66)	0.23 - 0.44
	Purchase	0.36 (±0.50)	0.29 - 0.43
	Total	**0.35 (±0.57)**	**0.29 - 0.41**
MAR for Protein, Iron & Vitamin A	Own production	0.64 (±0.21)	0.61 - 0.67
	Purchase	0.64 (±0.20)	0.61 - 0.67
	Total	**0.64** (±0.20)	**0.62 - 0.66**

Additionally, just about half of the children (45.3% vs 53.2%, for food purchase and own food production dependent households; respectively) had an adequate Iron intake implying the other half were at risk of dietary Iron deficiency. The difference was not however significant (p>0.05). The proportion of children with adequate dietary Vitamin A intakes was low (12.3% vs 11.4%, for food purchase and own production dependent households; respectively); implying that majority were at risk of Vitamin A deficiency (Figure 5). The difference

was not however significant (p>0.05).

When disaggregated by breast feeding status, the proportion of the non-breastfeeding children who had adequate Protein, Iron and Vitamin A intake increased across both entitlement categories (Table 6). The proportion of children with adequate iron intake was significantly higher (p ≤0.05) in the own production than in the food purchase dependent households.

Table 6: Proportion of non-breastfeeding children with adequate dietary intake (percent).

NUTRIENT	Level of adequacy	HH food entitlement category		X^2 test	
		Own food production (%)	Food trade dependent (%)	Value	2-sided asymp sig. at 95% CI
Protein	Inadequate	8 (6.6)	14 (8.8)	0.483	0.487
	Adequate	114 (93.4)	145 (91.2)		
	Total	**122 (100)**	**159 (100)**		
Iron	Inadequate	48 (39.0)	81 (50.9)	3.970	0.046
	Adequate	75 (61.0)	78 (49.1)		
	Total	**123 (100)**	**159 (100)**		
Vitamin A	Inadequate	106 (86.2)	137 (86.2)	0.000	0.997
	Adequate	17 (13.8)	22 (13.8)		
	Total	**123 (100)**	**159 (100)**		
MAR (Protein, Iron & Vitamin A)	Inadequate	83 (68.0)	115 (72.3)	0.612	0.434
	Adequate	39 (32.0)	44 (27.7)		
	Total	**122 (100.0)**	**159 (100.0)**		

Discussions

The present study contributes to the understanding of how different entitlements specifically food purchase and own production can affect nutrition. The rate of dependency on either form indicates the extent to which households are vulnerable to food insufficiency. On average, Ugandans tend to derive around half of their calories from home produced food and half from purchased food. Additionally, rural households are far more likely to produce their own food than urban households. In this study, it was established that a sizeable number of households in the rural (such as Omoro) still depended on food purchase entitlement for their survival. Having obtained our samples through proportional piling, we could not establish the extent to which the whole rural community relies on the different types of entitlement.

However, WFP (2013) reported that households in Gulu spend a higher share of their overall expenditure on food than other regions, with as much as 45 percent spending more than half of their overall income on food, well above the national average of 30 percent.

In the rural still, food insufficiency is more closely associated with home production and for those that produce and are deficient have several reasons to explain their fate including; lack of economic means to purchase the production shortfalls in sufficient quantities.

The findings of this study indicate that children in the purchase dependent households had a significantly more diverse diet that those from the own production category. Results from a related study (Sibhatu et al., 2015) also revealed that on-farm production diversity is positively associated with dietary diversity but with relatively small effects compared to the effects of market access. In fact, home production is more associated with high staple consumption, an indicator of low diversity/ poor quality diet. Households that buy a higher share of food (with less than 75 percent of energy derived from staples) are likely to have a better quality diet. This agrees with the findings of this study, postulating that those who produce their own food in form of staples tend to cover their food needs but not their diversity requirements.

The finding that grains, roots and tubers were the most consumed while eggs, dairy products and flesh foods were the least consumed is consistent with that of other studies (ACF, 2011;UBOS, 2013). Cereals such as maize, sorghum and millet; and roots and tubers such as sweet potatoes and cassava are the most widely grown crops in Northern Uganda. The low consumption of animal products is a result of low ownership of livestock in the district coupled with a high level of income poverty that renders the highly priced animal products unaffordable to most households. According to the World Bank Group (2016), 47% of the population in Northern Uganda were living below the international extreme poverty line of US$1.90 by 2013.

Based on WHO (2008) dietary diversity cut off point of 4.0, only about 50 percent of the children in this study had an adequate diet. However according to ACF (2011) up to 66 percent of children aged 6-23 months consumed diets with medium to high diversity but based on the cutoff of 3.0. This difference in cutoff points as well as age groups used renders the data un-comparable. Recent data from UBOS (2013) reported that 64.7 percent of the population in Northern Uganda consumed highly diverse diets (with a score ≥4) and a mean dietary diversity of 4.8, a value higher than the finding from this study. Although both studies used the same

number of food groups (7), the food groupings were slightly different with UBOS (2013) considering oils and fats (widely consumed) as a food group which was however excluded in this research which used the WHO (2008) food grouping.

Currently there is no international consensus on which food groups to include to create dietary diversity scores at the individual level for different age/sex groups. Since micronutrient intake is positively associated with dietary diversity (Acham et al., 2012) the low dietary diversity observed is a risk factor for micronutrient deficiency which therefore calls for interventions aimed at diversifying the diets.

The MAR for Protein, Iron and Vitamin A indicated that there was not a significant difference in dietary adequacy between children in the own production and food purchase dependent households. Despite the lower value of the MAR (0.64 ± 0.20) than the 0.77 cutoff point, the NAR of Protein and Iron were high, rendering Vitamin A a limiting nutrient. The high NAR for Protein can be explained by the high consumption of plant Protein foods especially groundnuts, simsim and their products including pastes. Acholi sub region is particularly known for high consumption of groundnuts/simsim pasted sauces among which include "*malakwang", "boo", "otwoo"* among others; often accompanied by millet or sorghum bread, all of which are rich sources of Iron. Having conducted the study during the harvest season of groundnuts, it can partly explain our findings. Groundnut acreage has been the highest of all crops grown in the region with over 19,566 hectares grown in 2010. From the field observations, it was seen that many of the households had harvested and were sun drying groundnuts in their compounds.

Given the high NAR for Iron, the prevalence of anaemia (Haemoglobin concentration <11.0 g/dl) in the region is expected to be minimal, comparative results (UBOS, 2012) indicate that anaemia prevalence in the region is at 34.0 percent which, by WHO (2011) classification can be regarded as a moderate public health problem. The high prevalence of Iron deficiency anaemia in the region may be explained by other factors such as; low bioavailability of Iron in the plant based diets that are widely consumed in the region; coupled with poor food preparation methods and other health related problems. According to UBOS (2006) malaria accounts for a significant proportion of anaemia in children under five in malaria endemic areas. This study however did not assess malaria prevalence. Flesh foods such as meats and fish are known rich sources of bioavailable Iron but findings from this study indicated very low consumption of such foods, and a high consumption of plant based foods especially legumes and nuts (Figure 3).

The low NAR for Vitamin A is a reflection of the low dietary intake of Vitamin A rich foods by children. While Retinol is mainly derived from animal-derived foods such as liver, milk & milk products, egg yolks and fish, significant quantities of pro-vitamin A carotenoids are found in plant foods such as dark green leafy vegetables, orange and yellow coloured fruits such as mangoes and pawpaw among others.

The low consumption of flesh foods which are rich sources of Vitamin A (Figure 3) was generally accompanied by moderate consumption of Vitamin A rich fruits and vegetables which was expected to have translated to a higher NAR for Vitamin A. This low NAR of Vitamin A may therefore be explained by the low quantities of dark green leafy vegetables (the most readily available plant sources of Vitamin A) at the time of the study, coupled with the poor preparation methods for the children to consume. Dark green leafy vegetables are often not liked by children owing to their high fiber content and flat tastes and therefore minimally consumed. Seasonality in supply of vitamin A rich fruits such as mangoes is also a contributing factor to the low Vitamin A intake observed as this study was conducted at a time when mangoes were off season. Despite the low dietary intakes of Vitamin A rich foods, the fairly high coverage of Vitamin A supplementation in Northern Uganda which stands at over 59% (UBOS, 2012), and the ability of the liver to store Vitamin A for up to 6 months reduces the risks of Vitamin A deficiency among children. According to UBOS (2006) the prevalence of Vitamin A deficiency (VAD) among children 5-59 months in Northern Uganda was 19.8%. This prevalence was ranked 4th lowest of the 9 regions in which the survey was conducted. The most recent Uganda demographic and health survey (2011) did not report on Vitamin A deficiency prevalence.

Conclusion and Recommendations

Household food entitlements affects dietary adequacy for Iron and diversity among children 6-59 months in Gulu District, with dependence on food purchase being associated with a more diverse diet. Development of effective agricultural markets and marketing systems, as well as promotion of agro processing and value addition to agricultural products in the Community is important so as to serve these markets. Since dietary diversity is a vital element of diet quality and that consumption of foods from a variety of food groups more or less guarantees adequate intake of essential nutrients and important non-nutrient factors, it's important that researches exploring the relationship between food entitlements and dietary adequacy of energy and other micronutrients are conducted.

Acknowledgement

The authors would like to thank the Norwegian agency for development cooperation (NORAD) for financing

this study under its NOMA programme.

REFERENCES

ACF. (2006). *Nutrition Survey Report IDP camps, Gulu District, Northern Uganda.* Kampala: ACF.

ACF. (2011). *Nutrition Surveilance Acholi Region.* Kampala: ACF.

Acham, H., Oldewage-Theron, W. H., & Egal, A. A. (February 2012). Dietary diversity, micronutrient intake and their variation among black women in informal settlements in South Africa: A cross-sectional study. *International Journal of Nutrition and Metabolism Vol. 4(2)*, pp. 24-39.

Anne, S., & Bilinsky, P. (2006). *Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (v.2).* Washington, D.C: Food and Nutrition Technical Assistance Project, Academy for Educational Development.

Bokeloh, G. (2005). Actions/Interventions to Improve Food and Nutrition Security at Meso and Micro level. In K. Klennert, *Achieving Food and Nutrition Security-Actions to meet the Global Challenge. A Training Course Reader.* Feldafing: InWEnt.

CARE. (2008). *The Coping Strategies Index; Field Methods Manual 2nd Edition.* New York: CARE.

Corbett, J. (1988). *Famine and Household Coping Strategies.* World Development.

Cochran, G. William. (1963). *Sampling Techniques,* Second Edition., New York: John Wiley & Sons, Inc.

Danny, H., & Fanzo. (2013). *Diversifying Food and Diets: Using Agricultural Biodiversity to Improve Nutrition and Health.* UK: Earthscan.

Drèze, J., & Sen, A. (1989). *Hunger and Public.* Oxford: Claredon Press.

FAO & WHO. (2001). *Guidelines for the production, processing, labelling and marketing of organically produced foods.* Rome: Codex Alimentarius Commission.

FAO. (2008). Lesson 2. The concept of the Right to Food. In *The Right to Food. A Primer to the Right to Adequate Food.*

FAO. (2009). *Guide to conducting a Right to Food assessment.* Rome: FAO.

FAO. (2010). *The Right to Adequate Food.* Geneva: United Nations.

FAO. (2011). *Guidelines for measuring household and individual dietary diversity.* Geneva: FAO.

FAO. (2013, March). Food Security Indicators. Rome.

FEWSNET. (2013). *UGANDA Food Security Outlook Update.* Kampala: USAID.

GDLG. (2012). *Gulu district five year development plan for the period FY2010/11 - FY2014/15.* Gulu: GDLG.

Harvest Plus. (2012). *A food composition table for central and eastern Uganda.* Washington DC: Harvest Plus.

Hatloy. A, Torheim .LE and Oshaug .A. (1998). Food Variety-a good indicator of nutritional adequacy of the diet? A case study from an urban in Mali, West Africa. *European Journal of Clinical Nutrition.*, 891-898.

IFPRI & FAO. (2008). Impact of Climate Change and Bioenergy on Nutrition. Rome.

Judith, B. E. (2011). *Nutrition through the life cycle.* Wadsworth Cengage.

Kashyap, P., Kaijuka, B. K., & Mabweijano, E. (2004). Targeting IDPs with Food Aid: World Food Program Assistance in Northern Uganda. *Health policy and Development Journal*, 96-99.

Margret D. Simko, C. C. (1995). *Nutrition Assessment: A comprehensive guide for planning interventions.* Jones and Bartlett Learning.

McLaren, D., & Moyo, B. (2014). *Monitoring and Evaluating Progressive Realisation of the Right to Sufficient Food and Basic Nutrition in South Africa.* Johanesburg: Studies in Poverty and Inequality Institute.

OXFAM. (2007). *Market Analysis Tools in Rapid-Onset Emergencies Phase One Report.* London: OXFAM.

Oxfam International. (2008). *From Emergency to Recovery; Rescuing Northern Uganda's Transition* . Kampala: Oxfam International.

Rathnayake, K. M., Madushani, P., & Silva, K. (2012). Use of dietary diversity score as a proxy indicator of nutrient adequacy of rural elderly people on Sri Lanka. *PubMed*, 469.

Riely , F., Nancy, M., Cogill , B., Bailey , L., & Kenefick, E. (1999). *Food Security Indicators and Framework for Use in the Monitoring and Evaluation of Food Aid Programs.* FANTA Publication.

Rosalind, G. (2005). *Principles of Nutritional Assessment* (2nd ed.). New York: Oxford University Press.

RoU & UN. (2009). *UNDAF Uganda 2010-2014.* Kampala: UN.

RoU. (2010, March). *Ministry of Agriculture, Animal Industries and Fisheries Development Strategy and Investment Plan*. Kampala.

ROU. (2010). *National Development Plan (2010/11-2014/15).* Kampala: ROU.

Ruel, M. (2003). Operationalizing dietary diversity: a review of micro nutrient issues and research priorities. *Journal of Nutrition*, 39.

Sen, A. (1981). *Poverty and Famines: An Essay on Entitlement and Deprivation.* Oxford: Claredon Press.

Sen, A. (1986). *Food, Economics and Entitlements.* World Institute for Development Econimics Research (WIDER) & United Nations University.

Torheim, L. E. (2004). Nutrient adequacy and Dietary Diversity in rural Mali; associations and determinants.

European Journal of Clinical Nutrition, 594-694.

Torheim, L. E., Barikmo, I., & Parr, C. L. (2003). Validation of food variety as an indicator of diet quality assessed with a food frequency questionnaire in Western Mali. *European Journal of Clinical Nutrition.*, 1283-1291.

UBOS & WFP. (2013). *Comprehensive food security and vulnerability analysis-Uganda.* Kampala: UBOS & WFP.

UBOS. (2006). *Uganda Demographics and Health Survey.* Kampala: UBOS and Macro International Inc.

UBOS. (2012). *Uganda Demographics and Health Survey 2011.* Kampala: UBOS.

UBOS. (2015). *Uganda Malaria Indicator Survey 2014-2015; Key Indicators.* Kampala: Ministry of Health-Uganda.

UBOS, W. &. (2013). *Comprehensive Food Security and Vulnerability Analysis Uganda.* Kampala: Uganda Bureau of Statistics.

UCC. (2010). *Rural Communications Development Fund (RCDF) Projects in Gulu District, Uganda.* Kampala: Uganda Communications Commission.

Uganda IPC TWG. (2014). *Report on the integrated food security phase classification analysis for Uganda.* Kampala: Republic of Uganda.

Uganda IPC TWG. (2015). *Report of the integrated food security phase classification chronic analysis for Uganda.* Kampala: Uganda IPC TWG.

UNCESCR. (1999). *General Commennt 12*. United Nations Secretariat.

UNHCHR. (2008). *Frequently asked questions on Economic Social & Cultural Rights.* Geneva: United Nations.

UNHR & FAO. (2010). *The Right to Adequate Food* (Vol. Fact sheet #34). Geneva: United Nations Secretariat.

United Nations. (1948). *Universal Declaration of Human Rights.* Geneva: United Nations.

United Nations Human RIghts. (1976). *International Covennant on Economic, Social and Cultural Rights.* Geneva: United Nations.

United Nations Human Rights. (1990). *Conventions on the rights of the child.* Geneva: United Nations Human Rights.

Wamala Edward. (2011). *Economic Liberalization and the Right to Adequate Food*. Kampala; Makerere University.

Weingärtner, L. (2005). The Concept of Food and Nutrition Security. In G. Bokeloh, M. G. Bentaya, & L. Weingärtner, *Achieving Food and Nutrition Security: Actions to Meet the Global Challenge; A Training Course Reader.* Feldafing: InWEnt.

WFP. (2006). *Food Security Assessment of IDP camps in Gulu, Kitgum and Pader districts*. Kampala: WFP.

WFP. (2007). *Emergency Food Security Assessment of IDP camps and Settled Areas in the Northern and North Eastern Conflict affected regions.* Kampala: WFP.

WFP. (2009). *Emergency Food Security Assessment Handbook.* Rome: WFP.

WFP. (2013). *Comprehensive Food Security and Vulnerability Analysis Uganda*. Kampala: WFP

WHO & UNICEF. (1990). Innocenti Declaration on the Protection, Promotion and Support of Breastfeeding. Florence, Italy.

WHO. (1995). *Physical Status; the use and Intepretation of Anthropometry.* Geneva: WHO.

WHO. (2008). Indicators for assessing infant and young child feeding practices: Part 1 Definitions. *Conclusions of a consensus meeting held 6–8 November 2007 in Washington D.C., USA.* Geneva: WHO Press.

WHO. (2011). *Iron Deficiency Anemia; Assessment, Prevention and Control. A Guide for Programme Managers.* Geneva: WHO.

Ziggler, J. (2008). *Report of the Special Rapporteur on the right to food.* United Nations Human Right office of the high commissioner.

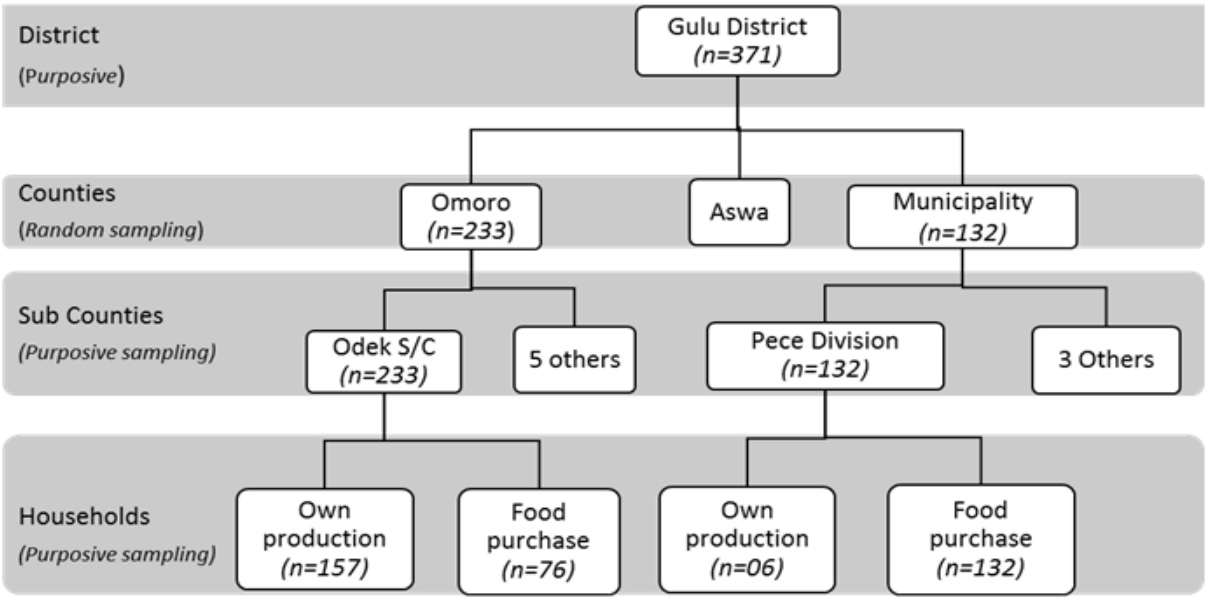

Figure 1: Sampling profile

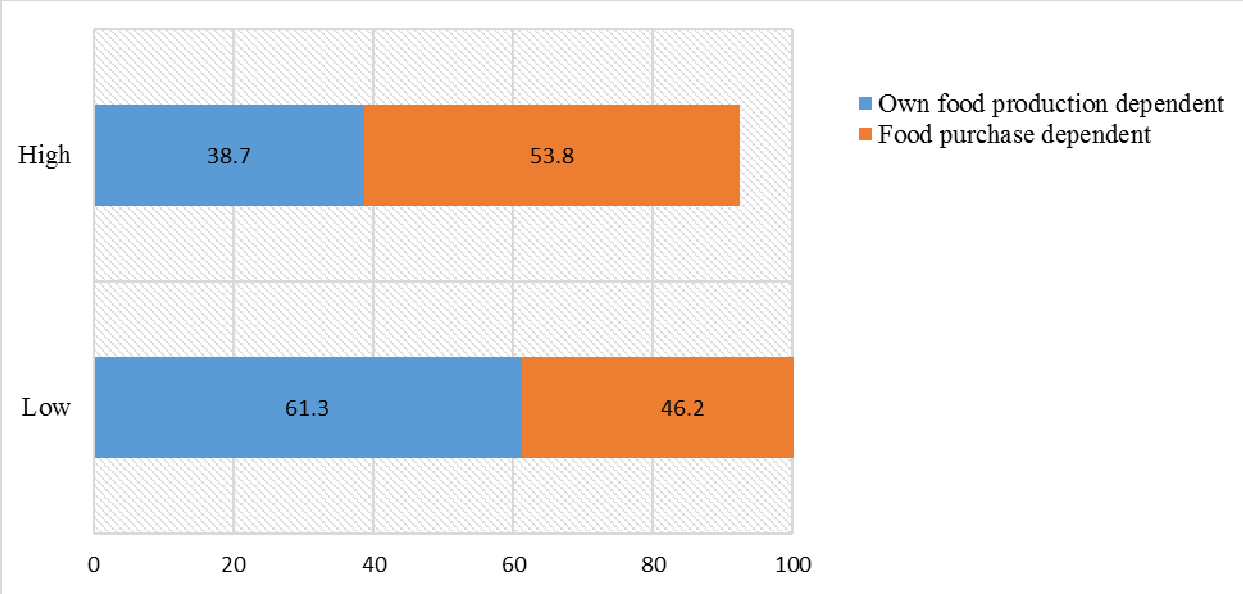

Figure 2: Proportion of children who consumed low and highly diverse diets (n=371)

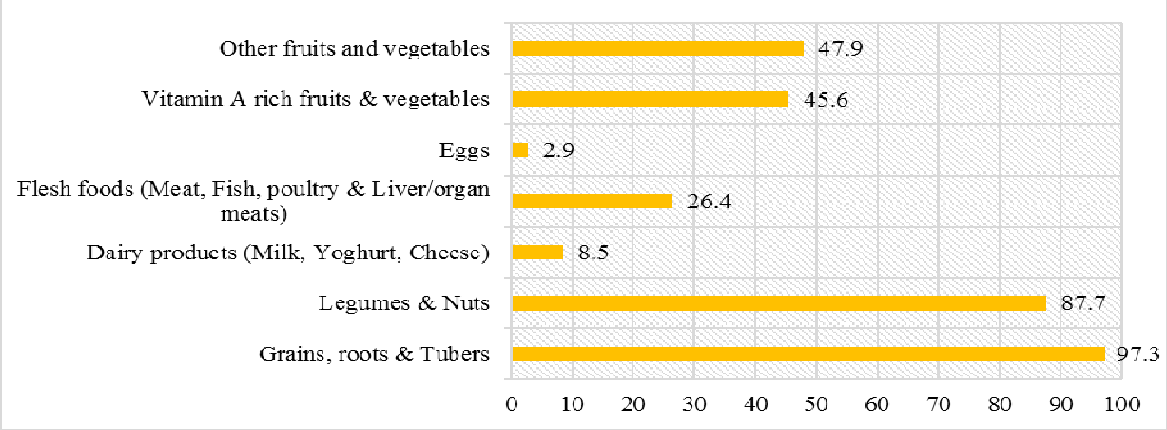

Figure 3: Proportion of children that consumed foods from the various food groups (percent), n=371.

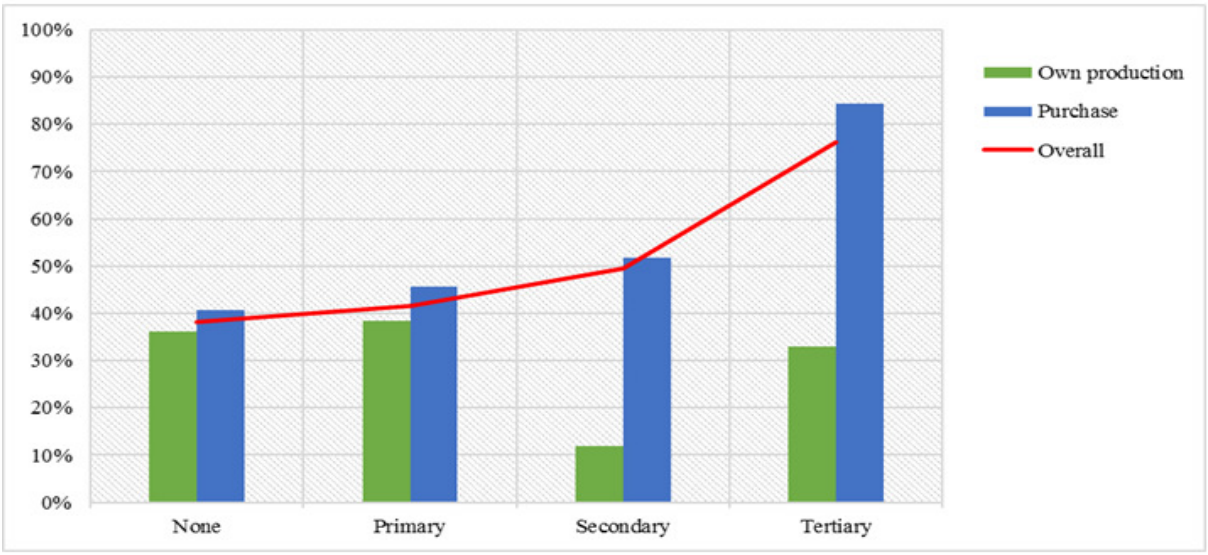

Figure 4: Relationship between proportion of children consuming adequately diverse diets and education level of household head (n=371)

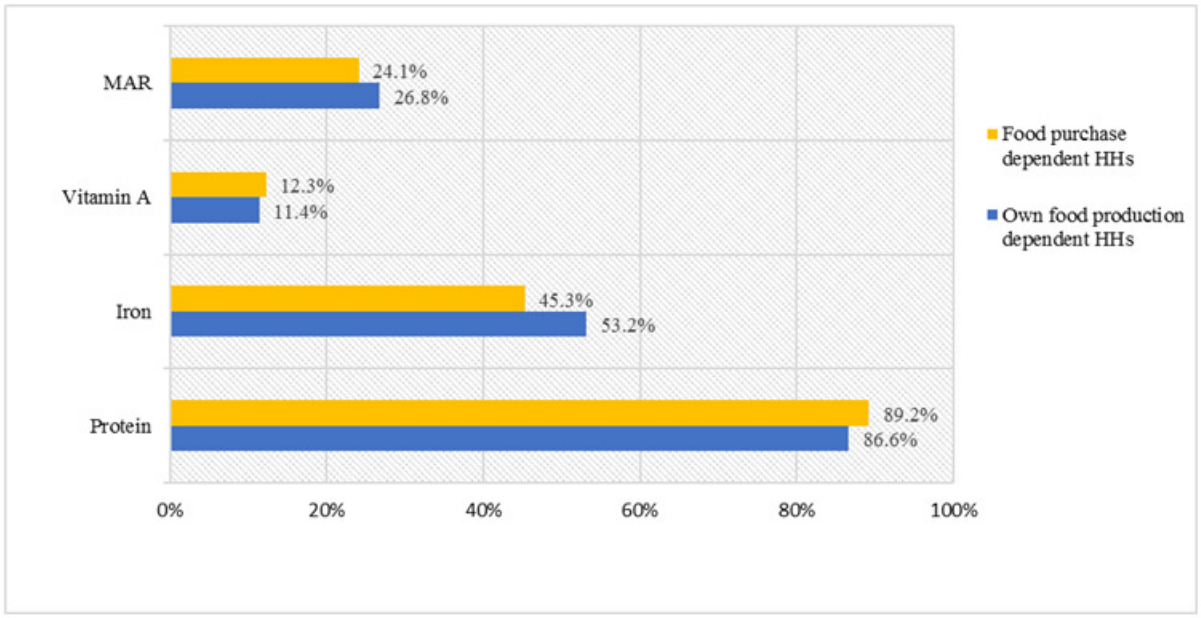

Figure 5: Proportion of children with adequate dietary intake (n=371)