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Socio-Economic Determinants of Dietary Diversity among Women of Child Bearing Ages in Northern Ghana

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Abstract
The main purpose of this paper is to analyse dietary diversity among mothers of child bearing ages in Northern Ghana and to identify socio-economic determinants of dietary diversity among these women. Data used in this paper were obtained from USAID sponsored METSS-Feed-The Future Population Baseline survey conducted in Northern Ghana in 2012. Descriptive statistics and Probit Regression analysis were used in analysing and identifying socioeconomic determinants of dietary diversity and the results presented in tables and graphs. The study found average dietary diversity score among the fifteen different food groups considered to be 5 (SD =2.41), with more than half of the mothers interviewed having their dietary diversity score falling below 5. Results of the probit analysis found age, marital status, and household membership structure, participation in household decision making, ethnicity and literacy as significant socioeconomic determinants of dietary diversity among mothers in Northern Ghana. The low dietary diversity among mothers, as revealed in this study is worrying and of great concerns requiring concerted policy intervention. It is therefore recommended as a matter of urgency that public health policy directions have to focus on helping improve dietary diversity among women through public education targeted at influencing eating habits and improving women's participation in household decision making processes.
Keywords: Socio-economic, Determinants, Dietary Diversity Score, Household and Child-bearing

1. Introduction

Safe motherhood, maternal and infant health issues have continuously engage the attention of policy makers, development partners and healthcare service providers with a collective aim of reducing maternal and infant mortality and child birth complications which have been a major public health concern of most developing countries. Many studies have demonstrated the critical role nutrition play in a mother's health, growth and development of her infant. It is therefore generally acclaimed that adequate nutrition is imperative during pregnancy as nutrition is an important factor in the health, growth, and development of the mother and the foetus (see Brenseke, Prater, Bahamonde & Gutierrez, 2013; Blumfield, Hure, Macdonald-Wicks, Smith & Collins 2012; American Dietetic Association, 2008). According to American Dietetic Association (2008), suitable prenatal weight gain is associated with a lower risk of complications during the pregnancy and the birth process.
The nutrition issues of women of child bearing have rarely been investigated. Since female are responsible for ensuring that a full term healthy viable infant is born and adequately nursed, maternal nutrition should be properly focused at all phases of reproductive life, to break the cycle of poor health and nutrition that passes on from generation to generation.

It is therefore a matter of great concern that maternal malnutrition had been identified as an important public health problem in low-income countries around the world. Mukuria, Aboulafia & Themme (2005) observed that the problem of maternal malnutrition is particularly evident in Africa, South/Southeast Asia, Latin America, and the Caribbean, where between 10 and 20 percent of women are undernourished (low body mass index). In Demographic and Health Surveys of most sub Saharan and South East Asian countries showed high undernourished rates of more than 20 percent among women of child bearing ages (USAID, 2012).

USAID, (2012) argued that, the most frequent proximate causes of maternal malnutrition include inadequate food intake, poor nutritional quality of diets, frequent infections, and short inter-pregnancy intervals. It is further observed in the 2012 report of USAID's Infant and Young Children Project in Ghana, Haiti and Cambodia that, these immediate causes of maternal malnutrition are recognized as stemming from wider contextual factors such as educational and socioeconomic status, ethnic and cultural beliefs, agricultural practices, national policies, and food insecurity.

The assertion that women particularly mothers, are gatekeepers of the families' diet, and are responsible for selecting, preparing, and serving families and households food, cannot be disputed (Ruel,

Deitchler & Arimond 2010). However, most public health programmes and projects designed to improve maternal nutrition have often focus on creating awareness of the need for dietary diversity for pregnant and nursing mothers with little attention being paid to possible underlying causes of household dietary diversity such as socio-economic, cultural beliefs and gender relation regarding household food production and control. A better understanding of the relationship between socio-economic factors and women dietary diversity will be useful in informing and guiding policy formulation and implementation with the ultimate goal of achieving safe motherhood and reducing childbirth related complications, as set up in the Millennium Development Goals 4 and 5.

As such this current paper, which relied on data from USAID Feed the Future Ghana Population Baseline survey conducted in Northern Ghana in 2012, used probit Regression model in testing and examining socio-economic determinants of maternal mothers' dietary diversity. Dietary Diversity Score (DSS) which is the number of different foods or group of food consumed within a given period usually 24 hours or a week (FANTA, 2006), was used as a proxy for nutritional status and nutrition intake of mothers surveyed under USAID Feed The Future and Monitory and Evaluation Technical Support Service (FTF-METSS) population baseline survey. Dietary diversity score as observed by Saka (2012) have been shown to be valid proxy indicators for household and individual dietary and micronutrient adequacy of diets.

Scientific evidence suggesting that dietary diversity scores can be a measure of micronutrient diet adequacy of women abound (see Arimond, Wiesmann & Becquey, 2010; Elodie et al , 2010; Hoddinott & Yohannes 2002). The concept of Dietary Diversity Score (DDS) in diet quality assessment has been tried in a number of places among some population groups (Mathews, Yudkin & Neil. 1999 as cited in Saka, 2012). This approach places emphasis on non-quantitative assessment of actual food consumption and give understanding of food security situation and micronutrient intake and adequacy (Saka. 2012; Arimond, Wiesmann & Becquey, 2010). Dietary Diversity has been validated through test studies and have been proven to be a useful measure of household and individual food security and micronutrient adequacy. Arimond et al, (2010), as cited in Saka, (2012) observed that, there have been three large multi-country validation studies and several smaller studies which have provided scientific evidence for use of dietary diversity scores as a measure of household food security and/or micronutrient adequacy of diets of women of reproductive ages.

2.0 MATERIALS AND METHODS

This current paper sourced data from USAID Feed the Future (FTF) Population baseline Survey conducted in Northern Ghana in 2012. The survey was conducted by METSS team including USDA/UCC/KSU and the Accra- based staff in partnership with the Institute of Statistical, Social and Economic Research (ISSER) of the University of Ghana as well as the Ghana Statistical Service. USAID/Ghana's FTF program requires a population-based survey (PBS), focused on a selection of required FTF impact and outcome indicators, for their Zone of Influence (ZOI) within northern Ghana (Maberry et.al, 2014).

2.1 Study Area

The survey was undertaken in Feed The Future (FTF) Zone of Influence (ZOI) which fall within the Savannah Accelerated Development Authority (SADA) Area. As such, the survey was limited to Savannah Accelerator Development Authority (SADA) area, which encompasses the area above Ghana's 8th parallel (Maberry, 2014). The broadly defined ZOI for Ghana contains the three northern most regions: Upper West, Upper East, and Northern Regions, plus a number of areas in the Brong-Ahafo Region which are above the 8th degree parallel. The sample in the analyses included 4,410 households with nearly 25,000 individuals in 45 districts across the four regions in the SADA Area. Map showing Feed The Future (FTF) Northern Ghana Zone of Influence (ZOI) is shown in the Figure.

Ghana has been designated as a priority country for the USAID's FTF initiative. The initiative supports growth of the agricultural sector and promotes good nutrition to attain its key goal, "to sustainably reduce global hunger and poverty by tackling their root causes and employing proven strategies for achieving large scale and lasting impact" (Zereyesus et. al, 2014 and Maberry et.al, 2014). The prevalence of poverty and proportion of underweight children are the key indicators chosen to measure success towards reaching the FTF goal. FTF activities for Ghana began in mid-2011 and are aligned with national strategies and development plans. At the public policy level, the goals of USAID FTF initiative is in harmonization with the goals of Government of Ghana (GoG) initiatives, particularly the Comprehensive Africa Agriculture Development Program (CAADP) and the Medium Term Agricultural Sector Investment Plan (METASIP), the Savannah Accelerated Development Authority (SADA), the Livelihood Empowerment Against Poverty (LEAP) program and possibly the Northern Development Initiative (NDI) (Maberry et.al, 2014). The full survey results which provided data for this study may be viewed here: http://www.metss-ghana.ksu.edu/population.html

2.2 Data Analysis

Data obtained from the USAID/METSS-FTF Population Baseline Survey conducted in Northern Ghana, was subjected to descriptive and probit regression analysis and the results presented in tables and graphs. The main variable of interest was dietary diversity, which was measured as Dietary Diversity Score (DDS) representing the sum of counts of different food groups eaten within the last 24 hours to the time that the interview was conducted in June, 2012 by enumerators of METSS-FTF Population baseline survey in Northern Savannah Areas of Ghana. Dietary diversity is usually measured by summing the number of foods or more often by counting the number of food groups consumed over a reference period (Ruel, 2002; Vakili et al., 2013). At household level, DDS is often used as proxy for determining food access while at individual level as a reflection of dietary quality (Vakili et al., 2013). The reference period usually ranges from one day (24hours) to three days, but seven days is also often used (FAO, 2011). In this survey, the reference point was 24hours and food groups; with detail description of various foodstuffs or meals is shown in the Table 1. As shown in the Table, if respondent ate from a named food group within the last 24 hours, he or she is scored 1 and 0 otherwise. The overall sum of the 1 or 0 (for yes/no) represented the respondents' DDS.

2.3 Probit Regression Model

In examining socioeconomic determinants of dietary diversity, a probit regression model was used. In measuring the level of dietary diversity among respondents of the population in the baseline survey, the median DDS among the fifteen food groups was calculated and used as a standard for the population. Respondents whose DDS were below the median were classified as 'low dietary diversity' and those with DDS above the median as 'high dietary diversity'. As such, the dependent variable (Dietary Diversity) was in binary category and was dummied as 1 = High Dietary Diversity (DDS greater than the median of the population) and 0 = low dietary diversity (DDS less than the median of the population).

Therefore the dependent Variable (Dietary Diversity) is a binary variable represented by 1 if high dietary diversity or 0 if otherwise. Models for explaining a binary dependent variable include the linear probability model (LPM), probit and logit models (Maddala, 1992; Greene, 2003 and Gujarati, 2004). However, since the dependent variable is dichotomous, the use of LPM is not appropriate because the predicted value can fall outside the relevant probability range of 0 and 1. Beside, it is also reported to have non-normal and non-constant error terms and posing constant effect of the explanatory variable. To overcome these problems, logit or probit models have been recommended. These models have been argued to have similar estimates (see Maddala, 1992; Greene 2003; Gujarati, 2004; Hill et al. 2008).

2.4 Specified Model

This paper adopted a probit model – also known as normit model (see Gujarati, 2004) in explaining socio-economic factors influencing mothers' dietary diversity. Sesabo, et al (2006) probit modelling idea was adopted in stating the specified model as shown below.

Di = f (Xi ……. Xn) . Where Di represents level of dietary diversity (i = 1: High Dietary Diversity – DDS greater than median of the population/ i = 0: otherwise) and X1…Xn represent socioeconomic factors predicting women dietary diversity.

$D_i = \beta_0 + \beta_n X_i + \varepsilon_i$

Where β_n represent coefficient of matrix Xi (Socio-economic determinants of Dietary Diversity). Table 2 presents definitions of variables used in the model

Hypothesis:

H_0: $\beta_n = 0$

H_a: $\beta_n \neq 0$

3.0 RESULTS AND DISCUSSIONS

This section presents findings and discussions of analysis of survey data obtained from USAID/METSS-FTF Population Baseline Survey, conducted in Northern Ghana.

3.1 Women's Dietary Diversity

Women's nutritional needs increases during pregnancy and lactation and as such there is the need to increase the consumption of various food groups and a combination of other foodstuffs for the supply of micronutrients in a balanced diet for their nutrient requirements. Since no single food group can contain all nutrients required for the healthy functioning and performance of the body, there is therefore the need for more food groups to be included in daily diet in order to meet their nutrient requirements (see Labadarios, Steyn & Nel, 2011). Kennedy et al., (2009) maintained that, a diet which is sufficiently diverse may reflect nutrient adequacy.

Christian, (2008) observed that, in general there are six different food groups widely consumed in Ghana. Namely starchy roots and plantain, grains and cereals, animal products, beans, nuts and oil seeds, fruits

and vegetables and fats and oils. However in this current study, 15 food groups were considered, with the view of examining into detail specific food groups being consumed as it relates to specific macro and micro nutrients requirements. As such, the broad food groups were reclassified as cereals and grains; white roots and tubers; vitamin A rich vegetables and tubers; dark green leafy vegetables; other vegetables, vitamin A rich fruits and other fruits. Others were organ meat; flesh meat; eggs; fish and seafood; legumes; nuts and seeds; milk and milk products; oil and fats; sweets and species; condiments and beverages. Respondents were required to indicate whether they had eaten any meal made from the above mentioned food groups within the last 24 hours. Analysis of responses gathered in the survey is presented in Table 2. As shown in the Table, overwhelming majority (82.57%) had eaten food made from cereals and grains such as corn/maize, rice, sorghum, millet among others within the last 24 hours to the time of the interview. This is to be expected since the staple foods in this part of the country are made from maize, millet and sorghum with rice now gaining popularity among the people. Also northern Brong/Ahafo Region, which is in the middle belt of the country, cereals and grains; and roots and tubers especially yam and cassava formed most of their daily calories intake. As demonstrated by the results of the analysis, more than one-third (38.76%) of the 4,572 women surveyed in the four regions had eaten food made from white roots and tubers within the last 24 hours. These findings confirm FAO (2009) Ghana Nutrition Profile, which observed that, Ghanaian diets largely rely on starchy roots (cassava and yams) and cereals (maize and rice). The report further found that starchy roots and cereals still supply almost three quarters of the dietary energy and diversity of diet remains low.

However, the revelation from the study that only 7.02% and 7.98% of the women surveyed reported to have eaten vitamin A rich vegetables and tubers and vitamin A rich fruits respectively within the last 24 hours, are worrying and raise serious concerns regarding reproductive health status of women in this part of the country. Equally worrying finding from the study, as shown in the Table 2, is that only 8.2%, 28.57%, 11.85% and 9.19% respectively reported that they had eaten organ meat, flesh meat, eggs and milk and milk products respectively within the last 24 hours. This is alarming considering the importance of protein and iron in ensuring women's reproductive health and safe motherhood (see Brenseke, et al, 2013 and Blumfield, et al, 2012; American Dietetic Association, 2008)). Also a mother's nutritional status, diet and lifestyle influence pregnancy and lactation outcomes and can have lasting effects on her offspring's health as observed by Elizabeth, (2010)

These findings raise worrying sign if considered in the light of the findings of Zulfiqar et al, (2013) that Maternal undernutrition globally contributes to 800,000 neonatal deaths annually; while stunting, wasting, and micronutrient deficiencies are estimated to underlie nearly 3•1 million child deaths annually. It is however refreshing that, majority of the respondents within the last 24 hours had eaten dark green leafy vegetables (71.72%), fish and seafood (74.26%) and species, condiments and beverages (63.25%).

3.2 Women Dietary Diversity Score

Combination of different food groups in a balanced meal is imperative in ensuring and maintaining good reproductive health of women and reducing maternal mortality and child-birth related health complications. This paper therefore examines DDS which is the sum of different food groups eaten within the last 24 hours (FANTA, 2006). In this study 15 different food groups were considered and respondents were required to indicate whether they had eaten a meal made from a given food group; which were coded as 'yes = 1' or 'no = 0'. The sum of 1s (yes) for a given respondent was recorded as his/her DDS. Summary of results are presented in Table 3. As shown in the Table, 25 respondents (representing 0.55%) indicated that they had not eaten any of the 15 food groups within the last 24 hours, whiles only 1 respondent reported to have eaten all the 15 different food groups within the period.

The average DDS was found to be 5(+/-2.41) different food groups eaten within the last 24 hours with 787 (representing 17.2%) of respondents saying they have eaten those food groups within the last 24 hours. The five most widely consumed food groups were cereals and grains, fish and seafood, dark green leafy vegetables, species, condiments and beverages and other vegetables apart from vitamin A rich vegetables such as tomatoes, onion and egg-plant. These findings confirm the findings of Christian, (2008) which revealed a low dietary diversity among women in Northern Ghana. Also, Saka, (2012) showed that maternal dietary diversity as measured by individual dietary diversity score scores (IDDS) was a significant independent predictor for mean birth weight and low birth weight (LBW). Therefore the low dietary diversity among mothers in northern part of Ghana, as revealed in this study is worrying and of great concerns requiring concerted government intervention. It is a matter of urgency that public health policy direction need to focus on helping improve dietary diversity among women through public education targeted at influencing eating habits and the need for mothers to eat proper balanced diets to meet the nutritional demand for pregnancy and lactation.

The distribution of DDS within the sampled population as surveyed under USAID FTF-METS Population Baseline survey were found to be normally distributed about the mean as shown in the Figure 2. As shown in the figure, majority of the respondents had their DDS falling within the range of 4 – 6 different food groups. Also, as shown in Figure 3, which presents a cumulative frequency distribution curve, the lower quartile

(thus up to 25%) of the 4,572 women interviewed consumed about 3 different food groups within the last 24 hours, whiles the upper quartile (up to 75%) of the sampled population ate about 7 different food groups within the period with the median quartile (up to 50%) eating 5 different food groups. This further demonstrated a low dietary diversity among reproductive aged women in northern Ghana.

3.3 Determinants of Women's Dietary Diversity

Based on theory and literature of empirical studies, variables ranging from socioe-conomic, cultural and women's power regarding household decision making and their participation in household production and management decision making processes were examined to assess their effect on women's dietary diversity score. Invariably, individual dietary diversity is a function of the kind of food available to them, either through production or purchase, their purchasing ability, their household size and structure and their location as either urban or rural, ethnicity or eating habit among others (see Pollack, 2001; Regmi, 2001; Ruel, 2002 and Rashid et al., 2006). Also, Thiele and Weiss (2003) (as cited in Taruvinga, Muchenje and Mushunje, 2013)) noted that household size, age, sex composition, employment status and level of education were the major determinants of food diversity.

Probit Regression Model was employed in identifying the socio-economic determinants of women's dietary diversity score (WDDS). Based on this understanding, the variables presented in table 4 were selected as independent variables in a probit regression model with women's level of dietary diversity (high/low) being the dependent variable.

As shown in the Table 4, the average WDDS is 5.01 different food groups, with most (75%) of the women interviewed coming from rural communities. Level of dietary diversity was determined by comparing respondents DDS with the median of the 4,572 population surveyed. The median DDS was 5 different food groups, with a little under half (48%) having their DDS being greater than 5. Women with DDS score more than the median were classified as having 'high dietary diversity' and with those scoring lower than median as 'low dietary diversity' .The average age of the respondents was 29.10 years (SD = 9.10) with the youngest being 15 years and the oldest 49 years. This indicates that most of the respondents interviewed during the USAID FTF-METSS population based survey were within their peak reproductive age ranges (see Saka, 2012 and Elizabeth, 2010). Most (82%) of the respondents came from male headed household with mixed sex and age household membership structure and an average household size of about 6 persons. The households were quite large compared with the national average household size of 4 persons according to the 2010 Population and Housing Census (see GSS, 2012).

Close to half (49%) of the respondents were of the Mole Dagomba ethnic group (the largest ethnic group in the northern region according to 2010 Population and Housing Census) and about (34%) being Muslims. The sampled population were predominantly illiterate population with only 14% and 7% being capable of reading and/or writing in English, the official language and local language respectively. Analysis of the survey data of women's body mass index (BMI) produced an average (BMI) of 22.26 (SD = 4.18) indicating that women captured in the survey were generally healthy using the body mass index as a proxy for health status (see WHO, 2006). Also, only 9% of the women interviewed said they were pregnant as at the time of the survey with majority of them being nursing mothers of children less than five years.

With regard to household food production, about 73% of the women interviewed participate in food crop production and livestock rearing. The major crops being cultivated in the northern part of the country include cereals such as maize, rice, millet and sorghum, roots and tubers mainly yam and cassava and legumes mainly soybean and groundnuts. The livestock kept were mainly poultry like local fowls and guinea fowls and small ruminants mainly goats and sheep. However, only 27% and 32% of the respondents indicated that they take part in all decisions regarding food crops production and livestock rearing respectively. Also another 27% and 32% of the women surveyed indicated that they actively take part in all household decision making regarding use of household income and food purchase with an average weekly food expenditure per household of GHS 15.23 (SD = 17.48). Also analysis of the baseline data indicates that respondents have very poor access to credit with only 13% of them indicated they had borrowed within the last 12 months, but reported that they do not have full control over their borrowed money as some household members have influence on how they use their borrowed money.

As shown in the Table 4, overwhelming majority (93%) of respondents depend entirely on fuel wood as their source of energy for cooking in their households.

3.4 Regression Results

Table 5 presents results of the regression analysis, showing coefficients of independent variables and their accompanying standard error and the probability scores. The LRchi2 (21) = 82.98 with Prob > chi2 =0.0000 indicating that the model best fit and significant in explaining the variation in women level of dietary diversity. The best fitness of the regression model measured by Pseudo R^2 =0.609 indicates that about 60.9% of the

variations in women dietary diversity can be explained by the variations in the selected independent variables. The regression results as presented in the Table 5, found location (rural or urban), marital status, household membership structure, household expenditure on food, literacy in local language, household food expenditure, decision on use of household income, decision on household food purchase and access to credit to be significant at 1% in influencing women's dietary diversity. While marital status and location were negatively related to level of dietary diversity, household membership structure, household expenditure on food, literacy in local language, decision on use of household income, decision on household food purchase and access to credit were positively related to women's level of dietary diversity, demonstrating that women interviewed from urban communities were more likely to report high level of dietary diversity than their counterparts from rural settlements. Also, contrarily to expectation, married respondents were found less likely to have high DDS. It was expected that married women who operate functional homes and family might be more likely to have access to diversified food since men are expected to be bread winners of their families.

However, as expected, respondents who read and/or write in local language were found more likely to have eaten high diversified diets within the last 24 hours to the time of the interview compared with those who neither could read nor write. Also respondents, who mostly participate fully in their household decision making regarding use of income, were more likely in reporting high dietary diversity than those who reported they are mostly not being involved in household decision making regarding use of household income. In addition, those households with mixed membership structure were more likely to have high DDS than households with only single sex membership structure. Also household food expenditure came out with highly positive significant relationship with dietary diversity. Households with higher expenditure on food reported higher DDS than households with lower household food expenditure.

Also, in one hand, while literacy in English language, decision making on household food purchase and decision making on household livestock production were found to be significant in determining women's level of dietary diversity 5%. In the other hand, ethnicity and age were both significant only at 10% in predicting level of women's dietary diversity. Also whilst literacy in English language, decision making on household food purchase and decision making on household livestock production were positively related to level of women's dietary diversity. Age and ethnic background of respondents were negatively related to women's DDS, indicating that respondents who were able to read and/or write in English language, participate fully in most household decision making regarding food purchase and livestock production were more likely to score high in DDS than otherwise. However, young respondents were more likely to have eaten highly diversified diets within the last 24hours to the time of the interview than their older counterparts.

The paper therefore found age, marital status, household membership structure, ethnicity and literacy as significant socio-economic determinants of dietary diversity of mothers in Northern Ghana. Also mothers' participation in household decision making regarding livestock production, food purchase, use of household income, access to credit and control over income as significant in predicting women's dietary diversity among mothers in Northern Ghana.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The study found average dietary diversity score among the fifteen different food groups considered, to be 5 (SD =2.41) with more than half of the mothers interviewed having their dietary diversity scores falling below 5. The five most widely eaten food groups were cereals and grains; fish and seafood; dark green leafy vegetables; species, condiments and beverages; and other vegetables such as tomatoes, onion and egg-plant. These findings revealed a low dietary diversity among women in Northern Ghana.

This paper found age, marital status, household membership structure, ethnicity and literacy as significant socio-economic determinants of dietary diversity of mothers in Northern Ghana. Also mothers' participation in household decision making regarding livestock production, food purchase, use of household income, access to credit and control over income were also found to be significant in predicting women's dietary diversity among mothers in Northern Ghana

The low dietary diversity among mothers in the northern Ghana, as revealed in this study is worrying and of a great concerns that require concerted holistic intervention. It is therefore recommended as a matter of urgency that public health policy directions need to focus on helping to improve dietary diversity among women through public education targeted at influencing eating habits and the need for mothers to eat proper balanced diets to meet the nutritional demand for pregnancy and lactation. Also there is the need for promoting gender mainstreaming in nutrition and public health policies and programmes to help empower women and improve their status and participation in household decision making, as it had been found to be significant in influencing women's dietary diversity.

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List of Tables

Table 1: Detail Description of Food Groups

FOOD GROUP	EXAMPLES	HAVE YOU CONSUMED [NAMED] FOOD WITHIN THE LAST 24 HOURS (Yes = 1/No = 0)
Cereals And Grains	Corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge or other grain products including local foods e.g.TZ, Banku, kenkey etc	
White Roots And Tubers	white potatoes, white yam, white cassava, or other foods made from these roots and tubers	
Vitamin A Rich Vegetables And Tubers	pumpkin, carrot, squash, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e.g. red sweet pepper)	
Dark Green Leafy Vegetables	dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, ayoyo, kontonmiri etc	
Other Vegetables	other vegetables (e.g. tomato, onion, eggplant) + other locally available vegetables	
Vitamin A Rich Fruits	ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya, dried peach, and 100% fruit juice made from these + other locally available vitamin A rich fruits	
Other Fruits	other fruits, including wild fruits and 100% fruit juice made from these	
Organ Meat	liver, kidney, heart or other organ meats or blood-based foods	
Flesh Meat	beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds, insects	
Eggs	eggs from chicken, duck, guinea fowl or any other egg	
Fish And Seafood	fresh or dried fish or shellfish	
Legumes, Nuts And Seeds	dried beans, dried peas, lentils, nuts, seeds or foods made from these (eg. hummus, peanut butter)	
Milk And Milk Products	milk, cheese, yogurt or other milk products	
Oils And Fats	oil, fats or butter added to food or used for cooking	
Sweets	sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes	
Spices, Condiments & Beverages	spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages	

Source: USAID/GHANA FTF-METSS Population Baseline survey Manure, 2012

Table 2: Distribution of Dietary Diversity

FOOD GROUP	CONSUMED WITHIN THE PAST 24 HOURS			
	Yes		No	
	No	%	No	%
Cereals And Grains	3,775	82.57	797	17,43
White Roots And Tubers	1,772	38.76	2,800	61.24
Vitamin A Rich Vegetables And Tubers	321	7.02	4,251	92.98
Dark Green Leafy Vegetables	3,279	71.72	1,293	28.28
Other Vegetables	2,022	44.23	2,550	55.77
Vitamin A Rich Fruits	365	7.98	4,207	92.02
Other Fruits	335	7.33	4,236	92.65
Organ Meat	375	8.20	4,197	91.80
Flesh Meat	1,306	28.57	3,266	71.43
Eggs	542	11.85	4,030	88.15
Fish And Seafood	3,395	74.26	1,177	25.74
Legumes, Nuts And Seeds	1,522	33.29	3,050	66.71
Milk And Milk Products	420	9.19	4,152	90.81
Oils And Fats	1,999	43.72	2,573	56.28
Sweets	1,305	28.54	3,267	71.46
Spices, Condiments & Beverages	2,892	63.25	1,680	36.75

Source: Analysis of USAID FTF-METSS Population Baseline survey, 2012

Table 3: Cumulative Frequency Distribution of Dietary Diversity Score

Dietary Diversity Score DDS	Frequency	Percentage (%)	Cumulative percentage
0	25	0.55	0.55
1	100	2.19	2.73
2	245	5.36	8.09
3	524	11.46	19.55
4	689	15.07	34.62
5	787	17.21	51.84
6	692	15.14	66.97
7	553	12.10	79.07
8	409	8.95	88.01
9	256	5.60	93.61
10	151	3.30	96.92
11	69	1.51	98.43
12	39	0.85	99.28
13	26	0.57	99.85
14	6	0.13	99.98
15	1	0.02	100.00
Total	**4,572**	**100.00**	

Source: Analysis of USAID FTF-METSS Population Baseline survey, 2012

Table 4: Description of Variables in the Probit Regression Model

Variable	Description	Mean	Std. Dev.
Women Dietary Diversity Score (WDDS)	Sum of different food group eaten within last 24 hours	5.01	2.41
Location	Dummy (Rural =1/otherwise =0)	0.75	0.43
Age	Measured in years	29.10	9.10
Household Size	Number of Persons within the household	5.65	3.35
Marital Status	Dummy (married =1/otherwise = 0)	0.34	0.47
Household Head Sex	Dummy (male = 1/otherwise = 0)	0.82	0.38
Household Membership Structure	Dummy (mixed = 1.otherwise = 0)	0.83	0.37
Religious Background	Dummy (Muslim = 0/otherwise = 0)	0.34	0.47
Ethnicity	Dummy (Mole Dagomba = 1/otherwise = 0)	0.49	0.50
Literacy in English Language	Dummy (can read and write = 1/otherwise =0)	0.14	0.35
Literacy in local language	Dummy (can read and write = 1/otherwise =0)	0.07	0.26
Women Weight in kg	Weight measured in kilogram	56.21	10.46
Women Height in Metre	Height measured in metre	1.59	0.08
Women Body Mass Index (WBMI)	Measured as ratio	22.26	4.18
Are you Pregnant	Dummy (yes = 1/otherwise = 0)	0.09	0.28
Did you participate in food production	Dummy (yes = 1/otherwise = 0)	0.73	0.48
How much input did you make in food production decision	Dummy (participate in all = yes / otherwise = 0)	0.27	0.44
How much input did you have in decisions of use of income	Dummy (participate in all = yes / otherwise = 0)	0.27	0.44
Did you participate in livestock production	Dummy (yes = 2/otherwise = 0)	0.37	0.48
How much input did have in livestock production decisions	Dummy (participate in all = yes / otherwise = 0)	0.32	0.48
How much input did you make in decision of food purchase	Dummy (participate in all = yes / otherwise = 0)	0.32	0.47
Access to credit	Dummy (yes = 2/otherwise = 0)	0.13	0.18
Do you have Control over borrowed money	Dummy (yes = 2/otherwise = 0)	0.03	0.17
What is the main source of cooking fuel for your household?	Dummy (firewood = 1 / otherwise = o)	0.93	0.26
Expenditure on food last week	In Ghana Cedis (GHS)[1]	15.23	17.48
Level Dietary Diversity	Dummy (1= if DDS>5/otherwise =0)	0.48	0.50

Source: Analysis of USAID/GHANA FTF-METSS Population Baseline survey, 2012
[1] Exchange rate of 1US Dollar = GHS 3.30

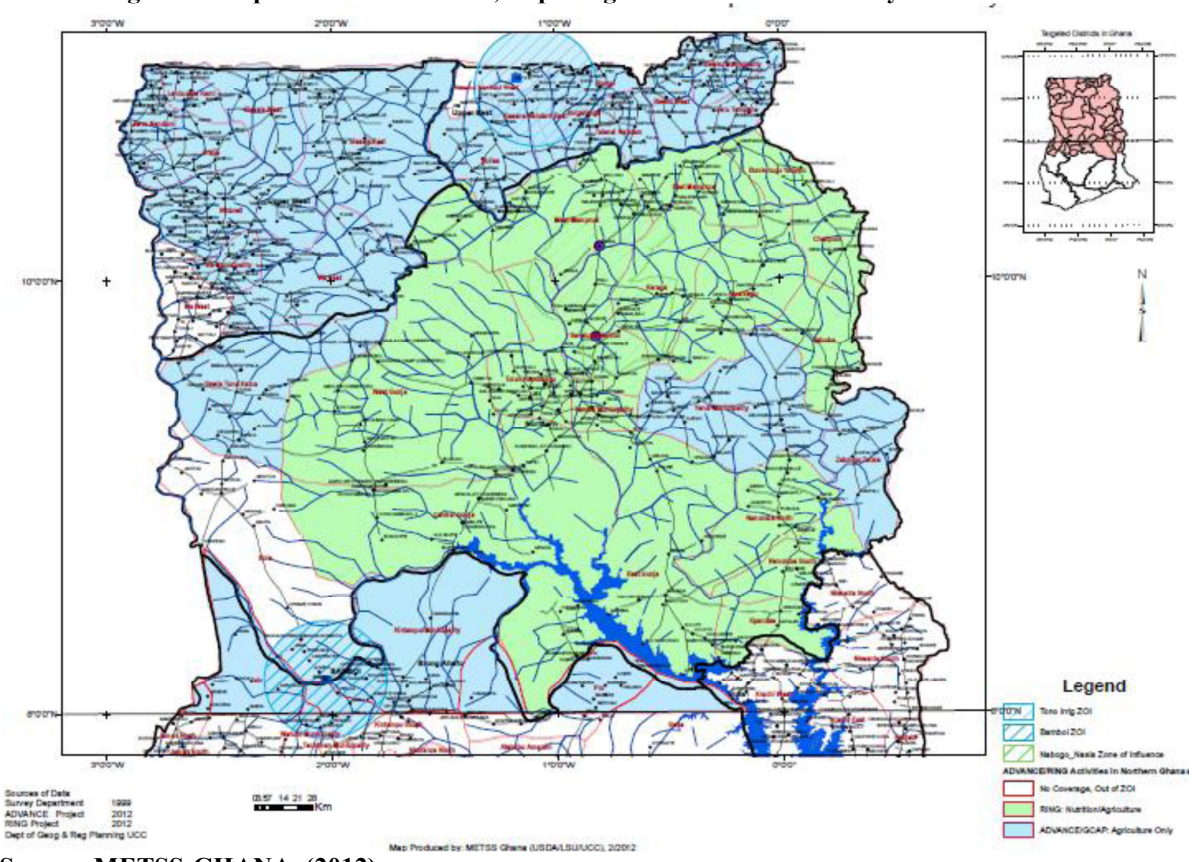
Table 5: Maximum Likelihood Estimation of the Determinants of Women's Dietary Diversity

Variables	*Coef.*	*Std. Err.*	*z*	*P>z*
location	-0.1285056	0.0444768	-2.89	0.004***
Marital Status	-0.1251756	0.0403297	-3.10	0.002***
Household Size	-0.0026419	0.006275	-0.42	0.674
Sex of Household Head	-0.0686231	0.0513919	-1.34	0.182
Household membership structure	0.1780975	0.058429	3.05	0.002***
Religious background	-0.0300016	0.0412935	-0.73	0.468
Ethnicity	-0.0678417	0.0386371	-1.76	0.079*
Age	-0.0034542	0.0020539	-1.68	0.093*
Household Expenditure on Food	0.0035628	0.0010702	3.32	0.001***
Literacy in English language	0.1138579	0.0574353	1.98	0.047**
Literacy in local language	0.2520322	0.0797292	3.16	0.002***
Pregnancy Status	-0.0446974	0.0679214	-0.66	0.510
Participation in food crop Production	-5.088728	92.76411	-0.05	0.956
Input into food crops production decision	-0.2511063	0.2404389	-1.04	0.296
Input into decision on use of income	0.0937461	0.0237759	3.94	0.001***
Did you participate in livestock rearing	5.042894	92.76414	0.05	0.957
Input into livestock production decision	0.6797258	0.223443	3.04	0.002**
Input into decisions on food purchase	0.4082888	0.2018595	2.02	0.043**
Access to credit	0.6665796	0.2352976	2.83	0.005***
Control of use of borrowed money	-0.7842143	0.2279018	-3.44	0.001***
Main Fuel for cooking	-0.1112377	.0683477	-1.63	0.104
_cons	0.2911754	0.1934551	1.51	0.294
Number of Observation = 4.572				
LR chi2(21) = 82.98				
Prob > chi2 = 0.0000***				
Pseudo R2 = 0.6091				
Log likelihood = -3124.4156				

Source: Analysis of USAID FTF-METSS Population Baseline survey, 2012

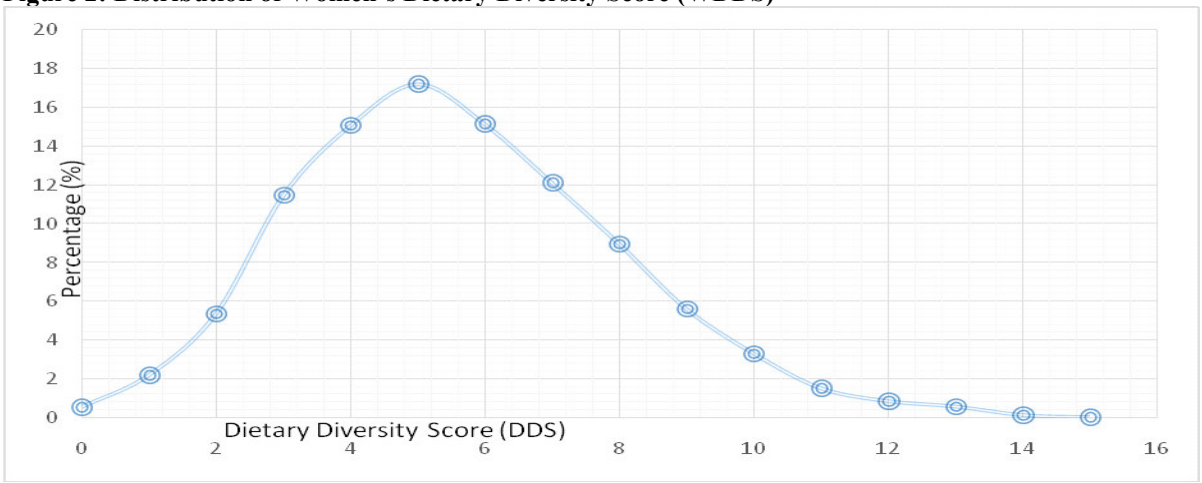
List of Figures

Figure 1: Map of Northern Ghana, Depicting the Zone of Influence by FTF Intervention



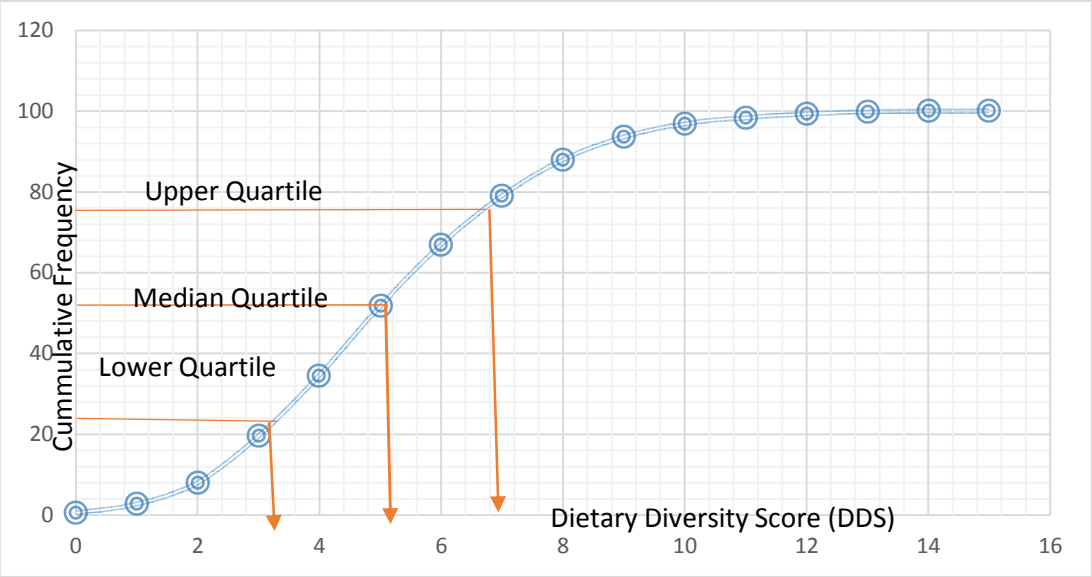
Source: METSS-GHANA, (2012)

Figure 2: Distribution of Women's Dietary Diversity Score (WDDS)



Source: Analysis of USAID FTF-METSS Population Baseline survey, 2012

Figure 3: Cumulative Frequency Curve of Women's Dietary Diversity Score.



Source: Analysis of USAID FTF-METSS Population Baseline survey, 2012

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