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DIETARY DIVERSITY AMONG FEMALE STUDENTS IN PUBLIC UNIVERSITIES OF AKWA IBOM STATE, NIGERIA

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Abstract
The study assessed the dietary diversity among female students in public universities of Akwa Ibom State, Nigeria. Specifically, the study determined the frequency of consumption of food groups within the recall period, the prevalence, margin and intensity of dietary diversity of the respondents. A two-stage sampling procedure was used to select 182 respondents. Data were collected with the aid of a well-structured questionnaire and analyzed descriptively. Majority of the respondents were single (61%), and (64%) received a monthly allowance of ₦15000. Many consumed starchy staple foods, beans and peas, vitamin A-rich vegetables and other vegetables and fruits. About 55% of the respondents were dietary diverse, based on the average as critical index. Disaggregated mean prevalence pair for dietary diverse and non-dietary diverse female students, is 0.85 and 0.51. Mean margin, expressed as a function only for those who are not dietary diverse, with the mean and 2/3 of the mean as critical index respectively are 0.19 and 0.26 respectively. The study concluded that there is a margin between dietary diverse and dietary non-diverse students, and recommends that the gap between these two categories be bridged by programmes geared at encouraging more dietary diversity. This can be done with policy advocacy on production, purchasing and consumption decisions with special emphasis on dietary needs.

Keywords: Dietary diversity, prevalence, margin, and intensity.

Introduction

Globally, there is evidence that approximately 2 billion people are suffering from hidden hunger which has negative effect and contributes significantly to the global burden of disease Kraemer (2010). Food consumption pattern not only has effect on an individuals' well-being but also have implications for the society in general (Henry-Unaeze and Okonkwo, 2011). Increasing the variety of food across and within food groups is recommended in most dietary guidelines internationally because it is thought to ensure adequate intake of essential nutrients and to promote good health (Smith *et al*., 2000). Dietary diversity is the number of different foods and food groups consumed over a given reference period. Dietary diversity has been positively associated with the major components of food security that is; accessibility, availability, utilization and stability in the interaction between people and food, which is essential to ensure nutrients play their important role in the health of the human body (Hillbruner and Egan, 2008).

Malnutrition and micronutrients deficiencies continue to be a significant public health problem in developed countries (NFCNS, 2003) among women of reproductive age, infants and children. Maternal malnutrition is a major predisposing factor for morbidity and mortality among African women (Lartey, 2004), some of the causative factors are inadequate food intake, poor diet quality and frequent infections. Diet quality has been reported to be directly related to dietary diversity and inversely related to malnutrition in terms of delayed growth in children, nutrient deficiencies and the risk of chronic diseases generally (Azadbakht *et al.*, 2006; Styen *et al.*, 2006). Dietary diversity is measured at the household or individual levels. At the household level, it is generally regarded as a measure of access to food, that is capability of a household to obtain an adequate quality and quantity of food to meet all household members' nutritional requirements for productive lives. While at the individual level, it mirrors dietary quality, generally the micronutrients sufficiency of a diet (Burlingame, 2011). Proper dietary diversity forms the basis of a student's well-being. Young adults who have special nutritional needs for growth have not met the dietary recommendation for their age (Bonnie *et al*., 2004). Many undergraduate students are adolescent, who encounter numerous health risks along the path to adulthood, many of which affect quality and life expectancy. It is observed from studies that youths are particularly vulnerable to poor eating habits and are said to be in the habit of eating "junk", especially

(Papadaki and Scott, 2002). These poor eating habits may likely arise from lack of knowledge of the cumulative effect of their eating habits. In Nigeria, the establishment of fast food centers in urban areas have contributed to poor eating habits of students, as most Universities are located in Urban areas in close proximity to some of these fast food centers whose target are these young people who hardly have time to prepare their own food (Ajala *et al*., 2005).

Most undergraduates are likely to be responsible for their diets, for the first time away from home; therefore they need guidance on how to make informed dietary choices (Scitia *et al*., 2004). It is even more important in the case of the female students, as the nutritional status and needs of adolescent girls are crucial; girls will be the future mothers and will impact future generations. Therefore, an undernourished woman will give birth to an undernourished child, thus contributing to a vicious cycle. Therefore, it is essential to provide a basis for addressing the possible problem of undernourishment, as this will help to reduce the heavy burden of under-nutrition, (Burkania, *et al*., 2014). Furthermore, addressing their needs will further break the inter-generational cycle of malnutrition and chronic diseases (WHO, 2006). Studies, in dietary diversity (Taruvinga *et al*., 2013; Morseth *et al*., 2017; McDonald *et al*., 2015; Bezerra and Sichieri, 2011) revolve around obtaining mean dietary diversity scores, frequencies and mostly extending the boundaries to include factors affecting dietary diversity. Further review of extant literature reveals that across Nigeria, a number of studies have been carried out (Omage and Omuemu, 2017). Additionally, Nupo *et al*. (2014) similarly analysed dietary diversity and nutritional status of undergraduates in South-West Nigeria. Essien *et al*. (2014) conducted a study on dietary status and knowledge of student from selected secondary schools in Sokoto. This study, however, seeks to examine the prevalence, margin and intensity of dietary diversity of female students in public universities in Akwa Ibom State, bridging the gap in the dearth of such studies and as a major addition to the existing analytical frame of reference.

Methodology

Study Area

The study assessed the dietary diversity of female students in public universities in Akwa Ibom State, which are University of Uyo and AkwaIbom State University. University of Uyo (Uniuyo) was formerly known as the University of Cross Rivers State (Unicross). On October 1, 1991 the Federal Government of Nigeria established it as a Federal University, inherited students, staff, academic programmes and the entire facilities of the erstwhile University of Cross River State. Uniuyo has twelve (12) Faculties, the Postgraduate School and the School of Continuing Education. It is located in Uyo, capital of Akwa Ibom State, Nigeria. The total population of the students is twenty nine thousand (29,000). The university operates from four campuses namely: Permanent site/main campus, Town campus, Annex campus and ImeUmana Campus, EdieneAbak. Akwa Ibom State University was conceived and funded by the Akwa Ibom State Government in October 18, 2000, which was then called University of Technology (Akutech). The University opened its doors to its students in 2010/2011. The total population of the students is nine thousand (9,000). The university operates from two campuses, main campus located at Mkpat-Enin and a second campus at Obio-Akpa, Oruk-Anam Local Government in Akwa Ibom State. The University has six (6) faculties.

Data Collection

The sample size was obtained using the formula thus;

$$N = \frac{NX}{(X+N-1)}$$

Where, N= Population number

$$X = \frac{Z^2_{a/2} * P * (1- \tilde{a})}{MOE^2}$$

$Z^2_{a/2}$ = Critical value of the normal distribution at a/2 (e.g for a confidence interval of 95%; a is 0.05 and the critical value is 1.96)

MOE = Margin of error = 5% (0.05)

P = Sample Proportion = 50% (0.5)

N = Population Size; N for UNIUYO = 29000;
N for AKSU = 9000

First, we solve for X by substituting for $Z^2_{a/2}$; p, (1-p) and MOE as follows:

$$X = \frac{1.96^2 * 0.5 * 0.5}{(0.05)2}$$

$$= \frac{0.9604}{0.0025}$$

$$= 384.$$

Recommended Sample size for UNIUYO is hence obtained by simply substituting for X and N as follows:

$$\text{Sample size (n) for UNIUYO} = \frac{29000 * 384}{(384 + 29000 - 1)}$$

$$= \frac{11,13600}{29383}$$

$$= 378 \approx 380$$

Recommended Sample size for AKSU is, hence, obtained as follows by simply substituting for X and N.

$$\text{Sample size (n) for AKSU} = \frac{9000 * 384}{(384 + 29000 - 1)}$$

$$= \frac{3456000}{9383}$$

$$= 368.3$$

$$\approx 368$$

From the estimation, the recommended sample sizes for UNIUYO and AKSU were 380 and 368 respectively. These values were obtained with a margin of error (5%), confidence interval (95%) and a sample proportion of 50%. However, due to the restriction of lean finances, the researcher opted to use ¼ of recommended sample sizes for both UNIUYO and AKSU. This now reduced the sample sizes to be 95 and 90 for UNIUYO and AKSU respectively. Two- stage procedure was employed in sampling. To obtain this sample sizes given equal opportunity of being selected was given to each faculty. Four (4) faculties were randomly selected from seven (7) faculties in AKSU (across both campuses), six

(6) faculties were randomly selected from twelve faculties in UNIUYO giving a total of ten (10) faculties. In AKSU, twenty seven (27) students each were randomly selected from each of the four (4) faculties, giving a total of one hundred and eight (108) respondents. This was to make allowance for improperly filled questionnaires. One Hundred (100) questionnaires were properly filled and data coded for subsequent analysis. In UNIUYO, eighteen (18) students were randomly sampled from each of the six (6) faculties giving a total of one hundred and eight (108). However, about one hundred (100) questionnaires were adjudged suited for data coding and subsequent analysis. Hence a total oftwo hundred (200) respondents were used for this study.

Analytical Framework: Prevalence, Margin and Intensity

The framework of estimation follow Udoh and Udoh (2020) who estimated the prevalence, margin, and intensity of dietary diversity of households in Akwa Ibom State. This study slightly modified their method or restricting the basis of categorizing households into dietary diverse and non-dietary diverse to two critical indices, the mean and two-thirds of the mean.

Dietary Diversity Index: This is obtained by expressing the number of food groups a respondent reports to have consumed within the recall period as a function of the total number of food groups (Table 2). It is therefore a figure that lies between 0 and 1; $^{1}/_{10}, ^{1}/_{10}$.....$^{10}/_{10}$

Dietary diverse and Non Dietary Diverse (Threshold Scores): Two threshold scores, namely; the mean dietary diversity score, and two thirds of the mean dietary diversity score are used to dichotomize students into dietary diverse and non dietary diverse. This is done such that students with values below the threshold scores are said to be non dietary diverse and students with value above and equal to threshold scores are said to dietary diverse.

Prevalence: Two measures of prevalence are applied and are reported in this case. These two are subsequently defined as follows;

Percentage prevalence: This is simply a percentage of female students who fall below (are not dietary diverse) and above / equal to (are dietary diverse) the critical scores. This measure uses an indicator function that takes on a value of 1 for students who are not dietary diverse (and or those who are dietary diverse-mutually exclusive), alternately and expresses it as a proportion of the total number of female students. Further multiplying the values by 100 gives the last outcome – percentage prevalence. This is given as;

Using mean as critical index:

$$ddi_{pp} = \sum_{i-1}^{N} 1(ddi < \overline{ddi})\frac{1}{N} \dots\dots\dots\dots\dots 9$$

$$\Sigma \quad ddi_{pp} = \sum_{i-1}^{N} 1(ddi \geq \overline{ddi})\frac{1}{N} \dots\dots\dots\dots\dots 10$$

Using 2/3 mean as critical index:

$$ddi_{pp} = \sum_{i-1}^{N} 1(ddi < {}^{2}/_{3}\,\overline{ddi})\frac{1}{N} \dots\dots\dots\dots 11$$

$$ddi_{pp} = \sum_{i-1}^{N} 1(ddi \geq {}^{2}/_{3}\,\overline{ddi})\frac{1}{N} \dots\dots\dots\dots 12$$

Where N = total number of female students.

Disaggregated mean prevalence: A second measure of prevalence is additionally obtained. This is essentially a mean computed based on actual values of *ddi* (as opposed to the use of an indicator function that assigns 1 to students who are not dietary diverse).

This measure is obtained as:

$$ddi_{pa} = \sum_{i-1}^{N} (ddi < \overline{ddi})\frac{1}{n} \dots\dots\dots\dots\dots 5$$

n = number of female students with ddi $< \overline{ddi}$.

$$ddi_{pa} = \sum_{i-1}^{N} (ddi \geq \overline{ddi})\frac{1}{n} \dots\dots\dots\dots\dots 6$$

n = number of female students with ddi $\geq$ ddi

Using 2/3 mean as critical index:

$$ddi_{pa} = \quad (ddi < {}^{2}/_{3}\,\overline{ddi})\frac{1}{n} \dots\dots\dots\dots 7$$

n = number of female students with ddi $< {}^{2}/_{3}$ ddi

$$ddi_{pa} = \sum_{i-1}^{N} (ddi \geq {}^{2}/_{3}\,\overline{ddi})\frac{1}{n} \dots\dots\dots\dots 8$$

n = number of female students with ddi $\geq {}^{2}/_{3}\,\overline{ddi}$.

Margin: The mean margin and mean proportionate margin are the measures of the margin, which is basically a deviation from the threshold score by female students who are not dietary diverse in the study area, are reported in this section. These two measures are computed based on the number of female students who are not dietary diverse and all students in the study area. The rationale for this, being that the number of female students who are not dietary diverse and all female students provide the basis for conclusion in terms of targeted interventions (ones geared towards female students who are not dietary diverse) and untargeted ones (ones spread across all female students) respectively.

Mean Margin: The mean margin measures the mean difference between students who are dietary diverse and those who are not. It, however, has the underlying assumption that dietary diverse female students all have a dietary diversity index that is equal to the threshold score. It in turn expresses it both has a function of only the female students who are not dietary diverse and also all female students.

Mean margin: This measure is obtained as:
Using the mean as critical index:

$$\text{ddi}_{\text{mm}} = \sum_{\text{i-1}}^{\text{N}} (\overline{\text{ddi}} - < \overline{\text{ddi}}) \frac{1}{\text{N}} \ldots\ldots\ldots\ldots\ldots 9$$

N = total number of female students

$$\text{ddi}_{\text{mm}} = \sum_{\text{i-1}}^{\text{N}} (\overline{\text{ddi}} - < \overline{\text{ddi}}) \frac{1}{\text{n}} \ldots\ldots\ldots\ldots\ldots 10$$

n = number of female students with $\text{ddi} < \overline{\text{ddi}}$
Using 2/3 of the mean as critical index:

$$\text{ddi}_{\text{mm}} = \sum_{\text{i-1}}^{\text{N}} {}^{2}/_{3}\,\overline{\text{ddi}} - < {}^{2}/_{3}\,\overline{\text{ddi}}) \frac{1}{\text{N}} \ldots 11$$

N = total number of female students

$$\text{ddi}_{\text{mm}} = \sum_{\text{i-1}}^{\text{N}} {}^{2}/_{3}\,\overline{\text{ddi}} - < {}^{2}/_{3}\,\overline{\text{ddi}}) \frac{1}{\text{n}} \ldots .12$$

n = number of female students with $\text{ddi} < {}^{2}/_{3}\,\overline{\text{ddi}}$

Mean Proportionate Margin: Is simply the mean margin expressed as a function of the critical score under consideration namely; the mean *ddi* and two-third of the mean *ddi* respectively.
Mean Proportionate Margin: This measure is given as:
Using the mean as critical index:

$$\text{ddi}_{\text{mpm}} = \sum_{\text{i-1}}^{\text{N}} (\frac{\overline{\text{ddi}} - < \overline{\text{ddi}}}{\overline{\text{ddi}}}) \frac{1}{\text{N}} \ldots\ldots\ldots\ldots .13$$

N = total number of female students

$$\text{ddi}_{\text{mpm}} = \sum_{\text{i-1}}^{\text{N}} (\frac{\overline{\text{ddi}} - < \overline{\text{ddi}}}{\overline{\text{ddi}}}) \frac{1}{\text{n}} \ldots\ldots\ldots\ldots 14$$

n = number of female students with $\text{ddi} < \overline{\text{ddi}}$
Using 2/3 of the mean as critical index:

$$\text{ddi}_{\text{mpm}} = \sum_{\text{i-1}}^{\text{N}} ({}^{2}/_{3}\,\overline{\text{ddi}} - < {}^{2}/_{3}\,\overline{\text{ddi}}) \frac{1}{\text{N}} \ldots . \ldots 15$$

N = total number of female students

$$\text{ddi}_{\text{mpm}} = \sum_{\text{i-1}}^{\text{N}} ({}^{2}/_{3}\,\overline{\text{ddi}} - < {}^{2}/_{3}\,\overline{\text{ddi}}) \frac{1}{\text{n}} \ldots\ldots .16$$

n = number of female students with $\text{ddi} < {}^{2}/_{3}\,\overline{\text{ddi}}$

Intensity: In both cases, the intensity is the mean margin squared and the mean proportionate margin squared respectively. These measures how critical, the deviation from the margin is, with a higher value suggesting a more critical case.
Intensity of the mean margin:
Using the mean as critical index:

$$\text{ddi}_{\text{imm}} = \sum_{\text{i-1}}^{\text{N}} (\overline{\text{ddi}} - < \overline{\text{ddi}}) \frac{1}{\text{N}})^2 \ldots\ldots\ldots 17$$

N = total number of female students

$$\text{ddi}_{\text{imm}} = \sum_{\text{i-1}}^{\text{N}} (\overline{\text{ddi}} - < \overline{\text{ddi}}) \frac{1}{\text{n}})^2 \ldots\ldots\ldots 18$$

n = number of female students with $\text{ddi} < \overline{\text{ddi}}$
Using 2/3 of the mean as critical index:

$$\text{ddi}_{\text{imm}} = \sum_{\text{i-1}}^{\text{N}} ({}^{2}/_{3}\,\overline{\text{ddi}} - < {}^{2}/_{3}\,\overline{\text{ddi}})^2 \frac{1}{\text{N}} \ldots 19$$

N = total number of female students

$$\text{ddi}_{\text{imm}} = \sum_{\text{i-1}}^{\text{N}} ({}^{2}/_{3}\,\overline{\text{ddi}} - < {}^{2}/_{3}\,\overline{\text{ddi}})^2 \frac{1}{\text{n}} \ldots .20$$

n = number of female students with $\text{ddi} < {}^{2}/_{3}\,\overline{\text{ddi}}$

2.3.5.2 Intensity of the Mean Proportionate Margin**:**
Using the mean as critical index:

$$\text{ddi}_{\text{ipm}} = \sum_{\text{i-1}}^{\text{N}} (\frac{\overline{\text{ddi}} - < \overline{\text{ddi}}}{\overline{\text{ddi}}})^2 \frac{1}{\text{N}} \ldots .21$$

N = total number of female students

$$\text{ddi}_{\text{ipm}} = \sum_{\text{i-1}}^{\text{N}} (\frac{\overline{\text{ddi}} - < \overline{\text{ddi}}}{\overline{\text{ddi}}})^2 \frac{1}{\text{n}} \ldots .22$$

n = number of female students with $\text{ddi} < \overline{\text{ddi}}$
Using 2/3 of the mean as critical index:

$$\text{ddi}_{\text{ipm}} = \sum_{\text{i-1}}^{\text{N}} (\frac{{}^{2}/_{3}\,\overline{\text{ddi}} - < {}^{2}/_{3}\,\overline{\text{ddi}}}{{}^{2}/_{3}\,\overline{\text{ddi}}})^2 \frac{1}{\text{N}} \ldots 23$$

N = total number of female students

$$\text{ddi}_{\text{ipm}} = \sum_{\text{i-1}}^{\text{N}} (\frac{{}^{2}/_{3}\,\overline{\text{ddi}} - < {}^{2}/_{3}\,\overline{\text{ddi}}}{{}^{2}/_{3}\,\overline{\text{ddi}}})^2 \frac{1}{\text{n}} \ldots .24$$

n = number of female students with $\text{ddi} < {}^{2}/_{3}\,\overline{\text{ddi}}$

Results and Discussion

Socio-economic Characteristics of Female Students

Results (Table 1) show that 61.5% of the respondents were single, 30% married, 4.5% divorced, 1.5% widowed, and 2 .5% separated. The majority in this distribution are single, and this suggest that the respondents prefer concentrating on their studies and getting their first degree before going into marriage. This table further shows that majority (67.5%) of the respondents reside outside the university community, while only 32% reside within campus. Further descriptive analysis (Table 1) shows that majority (64%) received ₦15000 monthly allowance, 13.5% ₦20000, 12.5% ₦25000, and 10% ₦6000. It showed that the students (64%, 13.5% and 12.5%) who received ≥ ₦15000 – ₦25000 monthly allowances seem to be satisfied with the money they get.

Table 1: Distribution of Socio-economic Characteristics of Students

Variables	Frequency	Percentage
Age		
16 – 20	47	23.50
21 – 25	80	40
26 – 30	48	24
Above 30	25	12.50
Marital Status		
Single	123	61.50
Married	60	30.00
Divorced	9	4.50
Widowed	3	1.50
Separated	5	2.50
Residence		
Off campus	135	67.50
Within campus	65	32. 50
Total	200	100
Monthly Allowance		
₦ 20000	27	13.5
₦25000	25	12.5
₦15000	128	64
₦6000	20	10
Total	**200**	**100**

Source: Field Survey, 2019

Food Groups Consumed within 7 – day Recall Period

Additional descriptive outcome (Table 2) shows that in descending order, 84% of the respondents consumed all starchy staple food within the recall period, 78.5% consumed beans and peas,74% consumed vitamin-A rich dark green vegetables, and other vit A-rich vegetables and fruits each. 71% consumed other fruits (like pineapple, orange, water melon and cucumber), while 65% consumed eggs, and other fruits (like carrot, pawpaw) each, etc. Results also show that 62% consumed nuts and seeds (like groundnut and cashew), 61% consumed fleshy foods (like beef, pork, goat meat, chicken), and 51% consumed diaries (like milk and yoghurt). It implies, therefore, that majority of the students consumed more foods belonging to the cereal, root and tubers, fruits, meats, oils and fats groups, and less foods belonging to the vegetable and eggs groups. Savy *et al*. (2006) reported that 77.7% and 61.7% of women consumed vitamin A, with fruit and vegetables, and meat, poultry and fish. These findings are in tandem with the result of this study as shown (Table 2). Furthermore, Ajani (2010) in assessing dietary diversity in six States found that 91.2%, 87.0% and 86.8% of respondents in AkwaIbom, Kwara and Osun State respectively, consumed white tubers. The author additionally, showed that 84.3% of respondents in Akwa Ibom State consumed vegetables. Lastly, in this context, Ajani, (2010) indicated that 63.9% and 62.8% of respondents in Kaduna and Taraba States respectively, consumed legumes, nut and seeds. Mbwana (2016) studied the determinants of household dietary practices in rural Tanzania, and reported that 72% and 73% of respondents in Morogora and Dodoma region consumed vitamin-A with other vegetables and tubers.

Table 2: Distribution of Food Groups Consumed within 7-day Recall Period

S/N	Food Groups	Frequency/ Percentage
1	All starchy staple food:Garri,yam,potatoes,cocoyam,or any other food from root and tuber	168 (84%)
2	Beans and peas:Irons,Brown beans,Honey Beans	157 (78.5%)
3	Nut and seeds: Groundnut,Cashew	132 (62%)
4	Dairies: Milk, Yoghurt.	103(51%)
5	Fleshy Foods:Beef,pork,Goat meat,Chicken,etc	122 (61%)
6	Eggs	131(65%)
7	Vitamin A – Rich dark green leafy vegetables: pumpkin	148(74%)
8	Othervitamin A –rich vegetables and fruits: Carrots, Pawpaw, Punpkin and Mango	131(65%)
9	Other vegetables:Editan,Atama,Afang,waterleaf,Green	148(74%)
10	Other fruits:Oranges,pineapple,Water melon,Cucumber.	142(71%)

Source: Field Survey, 2019

Prevalence of Dietary Diversity of Female Students in Public Universities in AkwaIbom State

Percentage prevalence (Table 3) reveals that with the mean *ddi* (0.7) as critical index, 44.50% of female students in public Universities are not dietary diverse. Similarly, taking $^{2}/_{3}$ of the mean, (0.5) as critical index, 9.50% of the female students in public Universities in AkwaIbom State are not dietary diverse. In corroboration, Leshi and Leshi (2017) reported low dietary diversity of 40% within the study population these authors considered. Further computation shows that, based on the mean (0.7) critical index, and disaggregating the female students into those that are dietary diverse and those that are not, the respective mean *ddi* are 0.51 and 0.85. This implies that female students who are not dietary diverse typically consume 5 categories on the list of food groups presented to them and those who are dietary diverse (about 9 of those groups); thus suggesting a gap of four (4) food groups in *lieu* of the dietary diverse.. Also, given 2/3 of the mean (0.5) as critical index, the mean for those who are not dietary diverse, and those who are, is 0.37 and 0.73 respectively. This means that at critical index of 0.5, female students who are not dietary diverse consume about four (4) categories on the list of food groups, and those that are dietary diverse, about seven (7) groups; hence revealing a margin of three (3) food groups between the two named categories. Schwei (2019), reported that greater than one-third of rural households consumed ≤ five (5), ≤ six (6) and ≥ seven (7) food groups each. This is closely related to the results of the disaggregated mean (Table 3) which shows that University students who are dietary diverse, using the mean as critical index, consumed (9) food groups (55% prevalence). It additionally ties in with the results (Table 3), based on $^{2}/_{3}$of the mean, where dietary diverse female students consumed (7) seven food groups in the recall period. Taruvinga *et al*. (2013) reported medium dietary diversity, that is, a range of (4-6) out of 12 food groups within the 24-hour recall period. This is fairly equivalent to a *ddi* of 0.3-0.5, in the context of this study. Thus suggesting consonance with the disaggregated mean prevalence, which using mean and two thirds of the mean as critical indices, this indicates that non dietary female students are consuming four (4) and five (5) food groups respectively. Ayenew *et al*(2018) obtained a mean dietary diversity of 6.4 and 6.6, during planting and harvesting seasons respectively, from a nine (9) food group poll. These figures are akin to a dietary diversity score of approximately 0.8, which corroborates the disaggregated mean prevalence (0.8) of dietary diverse female students in this study.

Table 3: Prevalence

	Percentage	Prevalence	Disaggregated mean Prevalence	
Critical Indices	**<Critical Index**	**≤ Critical Index**	**< Critical Index**	**≥ Critical Index**
0.7	44.50	55.50	0.51	0.85
0.5	9.50	90.50	0.37	0.73

Source: Field Survey, 2019

Margin of Dietary Diversity of Female Students in Public Universities in AkwaIbom State

The mean margin (Table 4), estimates the average gap between female students in public Universities in AkwaIbom State who are dietary diverse and those who are not. Given the mean and 2/3 of the mean as critical indices, the mean margin are 0.19 and 0.13, if the mean gap is obtained as a proportion of only those who are not dietary diverse. These values imply that female students who are not dietary diverse will need to consume about two more, and one more food category on the list of food groups respectively, to be moved into the group of those who are dietary diverse, assuming that only the female students who are not dietary diverse are encouraged to do so. On the other hand, the figures (Table 4), (0.09 and 0.01) reveal the mean margin as a proportion of the entire student body (those who are dietary diverse and those who are not), given the mean and 2/3 of the mean as critical indices respectively. These figures could mean that for all female students to be moved into the category of those who are dietary diverse, they would need to consume one extra item and none on the list of food groups presented, given the mean and 2/3 of the mean as critical indices, respectively. Mean dietary diversity terciles of 2.90, 4.53 and 6.37 are reported by Agada and Igbokwe (2015) for low, medium and high dietary diversity respectively. These authors further report an overall mean of 4.6. Their outcome, in tandem with the results of the mean margin reported in this study, implies a gap of two food groups between the respondents in the low and medium dietary diversity category; and a margin of three food groups between the low and high dietary diversity groups. Results of a study conducted by Leshi and Leshi (2017), indicated that 40%, 50% and 10% of their study population had low (<0.3), medium (≥ 0.3-0.5) and high (≥0.5-1) dietary diversity indices. These outcomes, in a similar vein, indicate a gap of a minimum of two (2) food groups between the low and medium diversity cadre, and a margin of a minimum of (3) food groups between the low and high dietary diversity food groups. Interestingly, Udoh and Udoh (2020), in consonance with the figures reported in this study, found a gap of two food groups, irrespective of the three critical indices employed.

Table 4: Margin

	Mean margin		Mean proportionate magin	
Critical Indices	n	N	N	N
0.7	0.19	0.09	0.27	0.12
0.5	0.13	0.01	0.26	0.03

Source: Field Survey, 2019

Intensity of the Margin of Dietary Diversity of Female Students in Public Universities in AkwaIbom State

The intensity of the margin (mean margin or the mean proportionate margin) measures the severity of the gap between the female students who are dietary diverse and those who are not. Given the mean and 2/3 of the mean as the respective critical indices (Table 5), 0.04 and 0.019 are the intensity of the mean margin when the mean margin is expressed strictly as a proportion of those who are not dietary diverse. The higher the value, the more severe the margin is. In expressing the mean margin as a proportion of the whole population, the respective values of the intensity (Table 5) are 0.02 and 0.0018. Given the mean (0.7), and 2/3 of the mean (0.5) as critical indices, also, 0.019 and 0.08 are the respective values of the intensity of mean margin and mean proportionate margin respectively, when the mean proportionate margin is obtained as a function of only those who are not dietary diverse. In a similar vein, the figures 0.04 and 0.007 are the value of the intensity of the mean proportionate margin, given the respective critical indices (0.7 and 0.5) where the mean proportionate margin was expressed as a function of the whole population (female students who are dietary and those who are not). The intensity of the mean margin and the mean proportionate margin are consistently higher when the mean is adopted as critical than for $^{2}/_{3}$ of the mean. Thus, implying that using the mean as critical index, the deviation from dietary diversity is more severe for female students in public Universities.

Table 5: Intensity

	Intensity of mean margin		Intensity of proportionate margin	
Critical Indices	n	N	n	N
0.7	0.04	0.02	0.09	0.04
0.5	0.019	0.0018	0.08	0.007

Source: Field Survey, 2019

Conclusion

The study shows that most of the respondents were within the age range of 21-25 years, majority of whom were single. A greater percentage received monthly allowance of ₦15000, reside off campus with <10 persons in their households, and consumed all starchy staple food, beans and peas, vitamin-A rich vegetables, other vegetables and other fruits within the recall period. The study additionally shows that less than half of the respondents are not dietary diverse. The intensity of the deviation from dietary diversity is clearly higher when the mean is adopted as critical index than when $^{2}/_{3}$ of the mean is similarly applied. The study further concludes that specifically obtaining additional measures of dietary diversity namely; disaggregated mean prevalence, mean margin and intensity provides a clearer picture of the dietary diversity of female students in public universities in AkwaIbom State. The gap between dietary diverse students and non-dietary diverse students should be bridged. This will be possible through programmes that could be targeted only at non dietary diverse students or could be all-embracing. Specifically the government and also non-government organizational programmes could seek to close the gap by focusing on getting students to increase the frequency of consumption of food groups particularly the least two frequently consumed namely: fleshy foods and diaries.

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