

Household food security status of rural mothers and nutritional status of their children under five years old in Ibadan, Nigeria

Adeyanju O.Z.*, Fadupin G.T.

Department of Human Nutrition and Dietetics, Faculty of Public Health, University of Ibadan, Nigeria.

Keywords: Food security, undernutrition, rural women, under-five children, nutritional status

<https://doi.org/10.26596/wn.202415452-58>

World Nutrition 2024;15(4):52-58

Background

The issue of food security in the rural regions of sub-Saharan Africa is of paramount importance, as it has a profound impact on malnutrition rates among children.

Objective

The objective of this study was to assess the household food security status of rural women food producers and the nutritional status of their under-five year old children in Ibadan, Nigeria.

Methods

For this analytical cross-sectional study among 217 mother-child pairs in the rural communities of Ibadan, interviewer-administered questionnaires were administered to obtain information on household, socio-demographic characteristics of mothers and the characteristics of their under-five children. Household food security was assessed using a USDA 18-point scale and categorized as food secure (≤ 2), food insecure without hunger ($>2-7$), food insecure with moderate hunger (8-12), and food insecure with severe hunger (>12). Child anthropometry was measured and expressed as stunting (height-for-age), wasting (weight-for-height), and underweight (weight-for-age) using Essential Nutrition Action software. Data were analysed using descriptive statistics, Fisher's Exact Test, and Spearman correlation coefficient correlation at $p \leq 0.05$.

Results

Ages of mothers and under-five children were 32.3 ± 6.2 years and 35.3 ± 14.1 months respectively. Household size was 6.3 ± 1.7 and 62.2% had no formal education. The household food security mean score was 8.2 ± 3.4 ; 88.5% were food insecure, 25.3% without hunger, 56.2% with moderate hunger and 7.0% with severe hunger. The totals of moderate or severe underweight, stunting and wasting in children were 30.4%, 40.5%, and 7.8% respectively. Food insecurity was significantly associated with children underweight ($p=0.010$). Mother's education ($p=0.000$), father's education ($P=0.012$), and household size ($P=0.008$) demonstrated significant associations with household food insecurity.

Conclusions

Food insecurity was prevalent in the study population. Provision of infrastructure that can stimulate a good business environment such as electricity, water, good roads, and accessible markets should be made available by all tiers of governments to enhance diversification of means of livelihood to alleviate poverty among the rural households.

INTRODUCTION

The UN Sustainable Development Goal (SDG) 2 ('Zero Hunger') aims to end all forms of hunger and malnutrition by 2030 (Atukunda et al., 2021). To achieve this in Sub-Saharan Africa, is the greatest challenge, more especially in

the rural areas, where the prevalence of under-five stunting and wasting is higher. (UNICEF, 2024).

Food security has been defined as adequate access to food by all people, at all times, for an active and healthy lifestyle (FAO, 2006). The definition focuses on food avail-

* Corresponding author: opadeyanju@gmail.com

ability. However, food availability is not sufficient for household food security, because food may be physically existent but not accessible to those most in need of it and may not even be utilized even after accessibility. Consequently, accessibility and utilization have been incorporated in defining food security, which can be said to be achieved only if adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible and satisfactorily utilized by all individuals at all times (Ezeh et al., 2020). Accordingly, FAO later defined food security as “a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” (FAO, 2018). On the other hand, food insecurity can be described as a situation “when people do not have adequate physical, social or economic access to food” (Clay, 2002). Household food insecurity has also been referred to as a situation of uncertain, insufficient, or unavailable access, or use of food (Obayelu et al., 2021). This implies insufficient intake of important nutrients and inadequate resources to afford sufficient, safe, and nutritious food both for individual and household needs, which leads to malnutrition.

Asia and Africa are presently the two continents of the world with the highest prevalence of undernourishment (FAO, et al., 2021). In Africa, the food-insecure population increased from 17.7% (203.5 million) in 2014 to 25.9% (346.6 million) in 2020. Western African nations were the most affected in the region with an extreme increase from 8.6% (29.6 million) from 2014 to 28.8% (115.7 million) in 2020 (FAO, et al., 2021), thereby accounting for 33.4% of the population who were food insecure on the continent.

The population of Nigeria has been estimated to be 209,663,744 (as of 12 October 2021). Nigeria was judged to be the highest producer of yam, cassava, and cowpea globally in 2012, and has remained the top producer of cassava, cocoyam, and yam, to date (Otekunrin et al., 2021; FAO, 2021). Yet Nigeria is also a major importer of food (Okpe & Ikpesu, 2021). However, neither local production nor import has translated to the country being food secure. About 30% of the population were estimated to be living in extreme poverty (64% of the rural and 14% of the urban population), under the poverty threshold of USD 1.90 (World Data Lab, 2021). Similarly, it was reported (Dansabo and Dabai, 2024) that 63% of persons living in Nigeria (133 million people) are multidimensionally poor and 40% are poor according to the 2018/19 national monetary poverty line.

A majority of the women who live in the rural area of developing countries are engaged in agricultural food production activities which play a critical role in supporting the three pillars of food security; food production, economic access to available food, and nutritional security for the members of their households, both in normal times and during periods of stress (Balakrishnan, 2005). Women account for 70% to 80% of household food production in sub-Saharan Africa, 65% in Asia, and 45% in Latin America and the Caribbean (Quisumbing et al., 2000). Mothers are crucial links between the family and health care systems and in addition, produce, purchase, prepare and serve food and provide a clean and safe environment. Moreover, women's incomes are more strongly associated with improvements in children's health and nutrition status than men's income

(Quisumbing et al., 2000).

While there are usually other issues such as infant feeding methods involved in maintaining a good nutritional status in children, food insecurity has been significantly associated with stunting (low height-for-age) (Dubois et al., 2016; Mutisya et al., 2015), poor health outcomes (Thomas et al., 2019), and wasting (low weight for height) (Motbainor et al., 2015). In a study conducted in rural Nigeria, it was reported that the health and nutritional status of children in rural subsistence farming households in the study area was poor (Adeyanju and Fadupin, 2022)

Since the majority (70%) of Nigerians live in rural areas (Akhimien et al., 2018), it is imperative to look into the food security status of the food producers in the rural areas with a particular focus on women, as well as the nutritional status of their children under five years old. The present study examines these factors in the rural areas surrounding the city of Ibadan in south-west Nigeria.

METHODOLOGY

This analytical cross-sectional study was carried out in 18 rural communities surrounding the large city of Ibadan, Nigeria. The study populations were rural mothers who were farmers and their under-five children. They were visited in their households.

The minimum sample size needed of mother-child pairs was determined by using the prevalence of malnutrition (underweight) among under-five children in farming households, in Oyo State, Nigeria which was earlier found to be 14.9% (Lawal and Samuel, 2010), using the formula:

$$N = \frac{Z^2 pq}{d^2}$$

$$\text{So, } N = \frac{1.96^2 \times 0.149 \times 0.851}{0.05^2} = 194.8 \approx 195$$

To cater for 10% attrition, we arrived at 215. Thus, 220 mother-child pairs were included in the study.

A multi-stage sampling technique was adopted in the selection of the respondents. Through balloting, the two local government areas (Ido and Akinyele LGAs) were selected. The farming communities/clusters where the study was carried out were haphazardly selected. Thirdly, the households were systematically selected using a sampling interval generated by dividing the total number of households with eligible participants in the clusters by the number required (110 households from each Local Government Area).

A semi-structured, interviewer-administered questionnaire translated to the local language (Yoruba) was used to obtain information on household and socio-demographic characteristics of mothers and the personal characteristics of under-five children.

DETERMINATION OF HOUSEHOLD FOOD SECURITY OF THE RESPONDENTS

Information on the main source of household foods and perception of food sufficiency was obtained using the 18-point Household Food Security Scale (USDA, 2000) categorized as food secure (≤ 2), food insecure without hunger ($>2-7$), food insecure with moderate hunger (8-12) and food insecure with severe hunger (>12).

ASSESSING PHYSICAL EXAMINATION UNDER-FIVE CHILDREN

Length/Height (cm), taking by a well calibrated stadiometer and weight (kg) taken by well calibrated bathroom scale (Camry P/1211/CRI) and age (in months) were taken from the mother and weight-for-height, height-for-age and weight-for-age, of the under-five children were determine using Essential Nutrition Action software. Data are reported as Z scores.

This study was piloted in two different clusters not selected for the main survey and four (4) trained research assistants were engaged for the survey.

DATA PROCESSING AND ANALYSIS

Statistical packages for social sciences (SPSS) software was employed to analyse the data after cleaning, cross-checking and verifying its accuracy. Descriptive statistics such as mean, standard deviation, frequency, and percentage as well as inferential statistics such as the non-parametric Spearman correlation and Fisher's Exact Test were used to determine statistical differences and associations between variables at 0.05 level of statistical significance.

ETHICAL CONSIDERATIONS

Ethical approval (Reference No UI/EC/13//0337) was obtained from the University of Ibadan/University College Hospital Institutional Review Board (IRB) and from the Local Governments where the research was carried out. Informed consent was obtained from community leaders, each family head, and the mothers.

RESULTS

Table 1 presents the demographic characteristics of the families included in our sample. The household food security status of the respondents is summarized in Table 2. The nutritional status of the under-five children in this study presented in Table 3 indicated that 30.4% were underweight. The bivariate links between families' household food security score and their children's anthropometric Z scores was statistically significant and negative only in the case of underweight, as presented in Table 4. The link between food security and household size was positive, but not significant when examined as a continuous variable.

Table 1. Household and demographic characteristics of sample mothers and their children (N=217)

Variable	Frequency	Percentage
Age of mothers (years) (min =20, max=52) mean =32.3±6.20		
20-30	96	44.2
31-40	102	47.0
41 and above	19	8.8
Mothers' marital status		
Married	208	95.9
Widowed	9	4.1
Mothers' level of education		
No formal education	135	62.2
Primary education	65	30.0
Post primary education	11	5.1
Complete secondary education	6	2.8
Mothers' main occupation		
Farmer	209	96.4
Artisan	4	1.8
Petty Trader	4	1.8

Table 1. continued

Number of children ever born		
1-3	61	28.1
4-6	142	65.4
7-10	14	6.5
Household size (mean= 6.28 ± 1.70)		
1-5	64	29.5
6-10	149	68.7
11-15	4	1.8
Sex of index under-five children		
Male	129	59.4
Female	88	40.6
Age of under-five children (months) mean=35.3±14.07		
0-11	6	2.8
12-23	58	26.7
24-35	55	25.3
36-47	52	24.0
48-59	46	21.2
Father's level of education		
No formal education	69	31.8
Primary education	77	35.4
Some secondary education	42	19.4
Complete secondary education	29	13.4
Father's main occupation N= 208		
Farmer	196	94.2
Artisan	7	3.4
Others (trader, clergy etc.)	5	2.4
Ownership of cultivated land		
Inherit	50	23.0
Purchase	1	0.5
Rent with payment	163	75.1
Lend without money	3	1.4

Table 2. Household food security of the respondents

Variable	Frequency	Percentage
Food Secure	25	11.5
Food Insecure, Without Hunger	55	25.3
Food Insecure, Moderate Hunger	122	56.2
Food Insecure, Severe Hunger	15	7.0
Total	217	100.0

Table 3. Nutritional status of under-five children of mothers in agricultural food production

Variables	Frequency	Percentage
Child Weight for Age (WAZ)		
Moderate underweight ((< -2Z-Score)	54	24.9
Severe underweight (< -3Z-Score)	12	5.5
Not underweight	151	69.6
Mean Score= -1.25±1.23		
Child Height for Age (HAZ)		
Moderate stunting ((< -2Z-Score)	45	20.7
Severely stunting (< -3Z-Score)	43	19.8
Not Stunted	129	59.5
Mean score= -1.74±1.50		
Child Weight for Height (WHZ)		
Moderate wasting ((< -2Z-Score)	9	4.1
Severe wasting (< -3Z-Score)	8	3.7
Not wasted	200	92.2
Mean Score= -0.23±1.32		
Total	217	100

Table 4. Correlation between household food security and nutritional status of under-five children and household size

Variables	Household Food Security
Children Nutritional Status	
Underweight	r= -0.189, P<0.01 (P= 0.005)
Stunting	r= -0.124, P>0.05 (P= 0.068)
Wasting	r= -0.116, P>0.05 (P= 0.089)
Household size	r= 0.074, P>0.05 (P= 0.281)

Table 5. Household characteristics and household food security status (n and % of n for that category)

Variable	Food Secure	Food Insecure Without Hunger	Food Insecure Moderate Hunger	Food Insecure Severe Hunger	Total	Fisher's Exact Test (P-Value)	Anova (P-value)	(P-value)
Age (years)								
20-30	14 (14.6)	24 (25.0)	48 (50.0)	10 (10.4)	96	0.425	0.964	
31-40	10 (9.8)	27 (26.5)	61 (59.8)	4 (3.9)	102			
41-55	1 (5.5)	4 (21.1)	13 (68.4)	1 (5.5)	19			
Marital Status								
Married	25 (12.0)	53 (25.5)	115 (55.3)	15 (7.2)	208	0.796	0.348	
Widowed	0 (0.0)	2 (22.2)	7 (77.8)	0 (0.0)	9			
Type of Marriage								
Monogamy	20 (11.5)	43 (24.7)	99 (56.9)	12 (6.9)	174	0.967	0.810	
Polygamy	5 (11.6)	12 (27.9)	23 (53.5)	3 (7.0)	43			
Mother's Education								
No formal education	11 (8.1)	34 (25.2)	81 (60.0)	9 (6.7)	135	0.000	0.027	
Primary education	7 (10.8)	21 (32.3)	34 (52.3)	3 (4.6)	65			
Some sec Education	6 (54.5)	0 (0.0)	5 (45.5)	0 (0.0)	11			
Complete sec. education	1 (16.7)	0 (0.0)	2 (33.3)	3 (50.0)	6			
Father's Education								
No formal education	4 (5.8)	11 (15.9)	46 (66.7)	8 (11.6)	69	0.012	0.001	
Primary education	7 (9.1)	20 (26.0)	47 (61.0)	3 (3.9)	77			
Some sec. education	7 (16.7)	13 (31.0)	19 (45.2)	3 (7.1)	42			
Complete sec. education	7 (24.1)	11 (37.9)	10 (34.5)	1 (3.4)	29			
Household Size								
1-5	3 (4.7)	22 (34.4)	34 (53.1)	5 (7.8)	64	0.008	0.217	
6-10	20 (13.4)	32 (21.5)	88 (59.1)	9 (6.0)	149			
11-15	2 (50.0)	1 (25.0)	0 (0.0)	1 (25.0)	4			
Total	25	55	122	15	217			

DISCUSSION

Previous studies have reported inequality in accessing safe and nutritious foods and corresponding high food insecurity among rural dwellers especially in the developing countries and its impact on under five children's nutrition (Akanbiemu et al., 2016; Drammeh et al., 2019).

The household sizes in the present study were relatively large, an average of 6.28, and 68.7% of the households has 6-10 members. Large resources would be needed to meet the nutritional requirements of such large household, in addition to the burden of paying landowners for the land they use for farming in most cases.

The overall prevalence of household food insecurity in this study was high (88.5%), and but similar to the 87.2% having varying levels of food insecurity among smallholder farming households in rural Oyo State (Otekinrin et al., 2021) and the 80.9% reported in rural and urban districts of Ondo State (Akanbiemu et al., 2016). Lower levels of 57% were found among cocoa farmers in Ondo State (Oluyole et al., 2009) and 65% among urban and rural communities in Ile-

Ife (Ajao et al., 2010). This study's high prevalence of household food insecurity may be attributed to the high level of poverty reported to be more pronounced in rural areas (Kanayo, 2015) reflecting also that 133 million Nigerians are multi-dimensionally poor (Dansabo and Dabai, 2024).

Children's nutritional status has been reported to be an indicator of the food security status of a household (Singh et al., 2014). In the present study, 30.4%, 40.5%, and 7.8% of the children were underweight, stunted and wasted respectively. A negative correlation between household food security scores and the under-five children's Z scores for underweight (but not wasting or stunting) was observed. As the household food insecurity score decreased (which portrays better food security status), these Z scores tended to increase. Mulu and Mengistie (2017) similarly reported significant association between household food insecurity and young child underweight in Ethiopia, whereas Singh et al. (2014) also found this with stunting and underweight in Nepal. Ajao et al., (2010) reported that food-insecure households were five

times more likely than secure households to have wasted children in a study carried out in Ile Ife, Nigeria. These findings highlight that young child malnutrition as one of the most severe consequence of food insecurity (Drammeh et al., 2019).

Household food insecurity of the women farmers in the study area was observed to have a statistically significant negative association with mother's education ($p < 0.001$) and father's education ($P < 0.05$). Akanbiemu et al. (2016) similarly reported that factors that significantly influenced household food insecurity include the educational level of primary care givers usually the mother. They and others (Modjadji and Madiba, 2019; Govender et al., 2021) have found that primary caregivers with no formal education were more food insecure than those with formal education. Mothers with no education were reported to be more than three times likely to have stunted children compare to mothers who had completed more than secondary education (NDHS, 2013). Educated mothers may positively influence their children nutrition, as they are better aware of the nutrition requirements of their children and they usually provide better care practices as a result of this awareness. In addition, low levels of educational attainment may serve as a barrier to better job opportunities.

The Spearman rank-order correlation coefficient indicated that, as the number of the household members increases, food insecurity increases, though not statistically significant ($P > 0.05$) although others have reported significant links (Oluwatayo, 2009; Ihab et al., 2015). In Sub-Saharan Africa, one of the main challenges among food-insecure households is the sharing of limited foods among large families, adding extra burden on available food for consumption (Drammeh et al., 2019). In the midst of food inadequacy, members of such large families are left to compete for limited food and children especially under-five years old in such settings become malnourished. Our data failing to find this link at a statistically significant level may be because our unusually large family size may have in many cases included adolescents or adults who could help with child care, agricultural tasks, etc.

CONCLUSIONS AND RECOMMENDATIONS

We found a high overall prevalence of household food insecurity among our sample of rural women food producers in Ibadan, Nigeria. Food insecurity was significantly associated with children underweight. Lower levels of mothers' and fathers' education demonstrated significant associations with household food insecurity. Provision of infrastructure that can stimulate an improved business environment such as electricity, water, good roads, and accessible markets should be made available by all tiers of governments. Promoting education of the rural children should be given adequate attention by all stakeholders, particularly for girls, as women's education is important to reducing malnutrition. Education influences farmers' adoption rates of new and productive innovation not only in agricultural practices but also in care and health seeking behaviour.

AUTHOR CONTRIBUTIONS

OZA and GTF conceptualized the study, wrote the original draft and were involved in the fieldwork. OZA supervised the data curation. OZA and GTF discussed the findings, and revised the manuscript, and gave approval for its publication.

CONFLICT OF INTEREST

The authors declare they have no conflict of interest concerning the research, authorship, and publication of this work.

ACKNOWLEDGEMENTS

None

FUNDING

The authors declare that no external funding was received from any organization or individual for this research, authorship, and publication of this article.

Received: November 21, 2024; **Revised:** December 17, 2024; **Accepted:** December 26, 2024; **Published:** December 31, 2024.



REFERENCES

- Adeyanju, O.Z. and Fadupin, G., 2022. Double burden of malnutrition among mothers and their under five children in rural areas of Oyo State, Nigeria. *World Nutrition*, 13(4):21-28. <https://doi.org/10.26596/wn.202213421-28>
- Ajao, K.O., Ojofeitimi, E.O., Adebayo, A.A., Fatusi, A.O. and Afolabi, O.T., 2010. Influence of family size, household food security status, and child care practices on the nutritional status of under-five children in Ile-Ife, Nigeria. *African Journal of Reproductive Health*, 14(4, Spec no.):117-126. <https://ajrh.info/index.php/ajrh/article/view/551>
- Akanbiemu, F.A., Fatiregun, A.A. and Adejugbagbe, A.M., 2016. Determinants of household food insecurity in rural and urban districts of a southwest state, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 13:1-11. <https://doi.org/10.9734/AIAEES/2016/29716>
- Akhimien, N.G., Adamolekun, M.O. and Isiwele, A.J., 2018. An overview of rural and community development in Nigeria. *Computers & Operations Research*, 79:223-263.
- Atukunda, P., Eide, W.B., Kardel, K.R., Iversen, P.O. and Westerberg, A.C., 2021. Unlocking the potential for achievement of the UN Sustainable Development Goal 2–‘Zero Hunger’–in Africa: targets, strategies, synergies and challenges. *Food & Nutrition Research*, 65. <https://doi.org/10.29219/fnr.v65.7686>
- Balakrishnan, R., 2005. Rural women and food security in Asia and the Pacific: Prospects and paradoxes. Rap Publication, 30. <https://openknowledge.fao.org/server/api/core/bitstreams/040c2388-ca67-490a-9e15-46113fc36218/content>
- Clay, E., 2002. Food Security: Concepts and Measurement. In: Proceedings of the FAO Expert Consultation on Trade and Food Security: Conceptualizing the Linkages, Rome, Italy, pp.25-34. <http://www.fao.org/3/y4671e/y4671e06.htm>
- Dansabo, M.T. and Dabai, U.I., 2024. The Impact of Poverty on Northern Nigeria’s Development: A Comprehensive Analysis. *International Journal of Research and Innovation in Social Science*, 8(8):838-849. <https://ideas.repec.org/a/bcp/journal/v8y2024i8p838-849.html>
- Drammeh, W., Hamid, N.A. and Rohana, A.J., 2019. Determinants of household food insecurity and its association with child malnutrition in Sub-Saharan Africa: A review of the literature. *Current Research in Nutrition and Food Science Journal*, 7(3):610-623. <https://dx.doi.org/10.12944/CRNFSJ.7.3.02>
- Dubois, L., Francis, D., Burnier, D., Tatone-Tokuda, F., Girard, M., Gordon-Strachan, G., Fox, K. and Wilks, R., 2016. Household food insecurity and childhood overweight in Jamaica and Quebec: a gender-based analysis. In: *Food Security and Child Malnutrition* (pp. 195-216). Apple Academic Press. <http://dx.doi.org/10.1186/1471-2458-11-199>
- Ezeh, S.I., Ogbo, A.I., Mbah, P.C., Diele, F., Okwudiri, C. and IWU, F., 2020. Production Innovation and Food Security in South Eastern Nigeria. *Test Engineering and Management*. 83,11969–11986.
- Atukunda, P., Eide, W. B., Kardel, K. R., Iversen, P. O., & Westerberg, A. C. (2021). Unlocking the potential for achievement of the UN Sustainable Development Goal 2–‘Zero Hunger’–in Africa: targets, strategies, synergies and challenges. *Food & Nutrition Research*, 65. <https://doi.org/10.29219/fnr.v65.7686>
- FAO. 2018. Food and Agriculture Organization of the United Nations Statistical Database; Statistical Division; FAO: Rome, Italy. <http://www.fao.org/statistics/en/>
- FAO, IFAD, UNICEF, WFP, WHO. 2021. The State of Food Security and Nutrition in the World 2021. In Transforming Food Systems for Food Security, Improved Nutrition and Affordable Healthy Diets for All; FAO: Rome, Italy.
- Govender, I., Rangiah, S., Kaswa, R. and Nzaumvila, D., 2021. Malnutrition in children under the age of 5 years in a primary health care setting. *South African Family Practice*, 63(1). doi: [10.4102/safp.v63i1.5337](https://doi.org/10.4102/safp.v63i1.5337)
- Ihab, A., Rohana, A. and Manan, W.W., 2015. Concept and measurements of household food insecurity and its impact on malnutrition: a review. *International Medical Journal*, 22(6):509-516.
- Kanayo, O., 2015. Poverty incidence and reduction strategies in Nigeria: Challenges of meeting 2015 MDG targets. *Journal of Economics*, 5(2):201-217. <https://doi.org/10.1080/09765239.2014.11884997>
- Lawal, B.O. and Samuel, F.O., 2010. Determinants of nutritional status of children in farming households in Oyo State, Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*, 10(10). <http://dx.doi.org/10.4314/ajfand.v10i10.62904>
- Motbainor, A., Worku, A. and Kumie, A., 2015. Stunting is associated with food diversity while wasting with food insecurity among underfive children in East and West Gojjam Zones of Amhara Region, Ethiopia. *PLoS One*, 10(8):e0133542. <https://doi.org/10.1371/journal.pone.0133542>
- Modjadji, P. and Madiba, S., 2019. Childhood undernutrition and its predictors in a rural health and demographic surveillance system site in South Africa. *International Journal of Environmental Research and Public Health*, 16(17):3021. <https://doi.org/10.3390/ijerph16173021>
- Mulu, E. and Mengistie, B., 2017. Household food insecurity and its association with nutritional status of under five children in Sekela District, Western Ethiopia: a comparative cross-sectional study. *BMC Nutrition*, 3:1-9. <https://doi.org/10.1186/s40795-017-0149-z>
- Mutisya, M., Kandala, N.B., Ngware, M.W. and Kabiru, C.W., 2015. Household food (in) security and nutritional status of urban poor children aged 6 to 23 months in Kenya. *BMC Public Health*, 15:1-10. <https://doi.org/10.1186/s12889-015-2403-0>
- NDHS 2013. Nigeria Demographic and Health Survey preliminary Report. Calverton, Md., United States: National Population Commission and ORC/Macro International Inc. <https://ngfrepository.org.ng:8443/handle/123456789/3139>
- Obayelu, O.A., Akpan, E.I. and Ojo, A.O., 2021. Prevalence and correlates of food insecurity in rural Nigeria: A panel

- analysis. *Economia Agro-alimentare*, (2021/2). <https://doi.org/10.3280/ecag2-2021oa12344>
- Okpe, A.E. and Ikpesu, F., 2021. Effect of inflation on food imports and exports. *The Journal of Developing Areas*, 55(4):1-10. <https://doi.org/10.1353/jda.2021.0075>
- Oluwatayo, I.B., 2009. Towards assuring households' food security in rural Nigeria: Have cooperatives got any place. *International Journal of Agricultural Economics and Rural Development*, 2(1):52-61.
- Oluyole, K.A., Oni, O.A., Omonona, B.T. and Adenegan, K.O., 2009. Food security among cocoa farming households of Ondo State, Nigeria. University of Ibadan Institutional Repository. <http://ir.library.ui.edu.ng/handle/123456789/2660>
- Otekunrin, O.A., Otekunrin, O.A., Sawicka, B. and Pszczółkowski, P., 2021. Assessing food insecurity and its drivers among smallholder farming households in rural Oyo State, Nigeria: The HFIAS approach. *Agriculture*, 11(12):1189. <https://doi.org/10.3390/agriculture11121189>
- Quisumbing, A.R., Brown, L.R., Feldstein, H.S., Haddad, L.J. and Peña, C., 2000. Women: the key to food security. *IFPRI Brief 3*. <https://hdl.handle.net/10568/156788>
- Singh, A., Singh, A. and Ram, F., 2014. Household food insecurity and nutritional status of children and women in Nepal. *Food and Nutrition Bulletin*, 35(1):3-11. doi: <https://doi.org/10.1177/156482651403500101>
- Thomas, M., Miller, D.P. and Morrissey, T.W., 2019. Food insecurity and child health. *Pediatrics*, 144(4): e20190397. <https://doi.org/10.1542/peds.2019-0397>
- Unicef, 2024. The State of Food Security and Nutrition in the World 2024. <https://openknowledge.fao.org>
- United States Department of Agriculture, (USDA) 2000. Guide to Measuring Household Food Security. Accessed at <http://www.econ.org/briefing/foodsecurity>
- World Data Lab. 2021. People living in the world in extreme poverty. <https://worldpoverty.io/headline>