Austin Journal of Nutrition and Food Sciences

Open Access

Austin Publishing Group

Special Article - Children's Nutrition

Household Food Insecurity is Associated with Children's Nutritional Status: A 2015 Cross-Sectional Study of Malawi

Ahmadi D*
McGill Institute for Global Food Security, Canada

***Corresponding author:** Davod Ahmadi, Research Assistant, McGill Institute for Global Food Security, Quebec, Canada

Received: October 09, 2019; **Accepted:** November 07, 2019; **Published:** November 14, 2019

Abstract

Child malnutrition is a serious public health problem in sub-Saharan Africa and presents various challenges for communities with a high rate of child mortality. This is especially a concern in Malawi, where the rates of child stunting are higher than most other areas in the world. The main purpose of this study is to investigate the association between household food security and child anthropometric indicators in Malawi. Data were obtained from "Feed the Future Malawi Interim Survey in the Zone of Influence". "The Feed the Future ZOI in Malawi covered at baseline and in the first interim assessment includes the rural areas of seven ZOI districts in the Central and Southern regions of Malawi: Balaka, Dedza, Lilongwe, Machinga, Mangochi, Mchinji, and Ntcheu". Different statistical analyses, such as descriptive and regression, formed basis of this study. Linear regression analysis was performed to determine the association between maternal food security and the outcomes variables of child underweight, stunting and wasting measured using z-scores. This study showed that household greater food security was associated with a lower risk underweight, but not with other indicators. In our adjusted model, child's sex, age and household highest education category were significantly associated with all anthropometric indicators. This research is important to inform food policy in Malawi for the improvement of child nutrition with a focus on food security initiatives.

Keywords: Food Security; Child growth; Dietary diversity; Malawi

Introduction

Child under nutrition is a major public health problem, particularly in developing countries [1]. Approximately one-third of all undernourished children globally live in sub-Saharan Africa (SSA) [2]; and chronic malnutrition has been a persistent problem for young children in the region [3]. In developing countries, the mortality rate of undernourished children is much higher than that of their well-nourished counterparts [4], as evidenced by reported associations between child malnutrition and child death in the literature [5].

Four principal anthropometric indicators used to measure malnutrition are stunting, wasting, underweight and BMI-for-age. Stunting refers to a condition in which a child has insufficient height for their age (H/A), while wasting describes a situation in which a child has failed to achieve sufficient weight for their height (W/H). Underweight is defined as a state in which a child's weight is less than expected for their age (W/A) [6]. Lastly, BMI-for-age is defined as children's weight in kilograms divided by the square of height in meters [7].

Child under nutrition remains a significant public health problem in Malawi [8] where it is amongst the countries with the highest prevalence of stunted children in SSA [9]. However, Malawi has made notable improvements in child health, including the reduction of infant and under-five mortality. Notably, the prevalence of stunting and underweight has been decreased since 1992; with the remarkable decrease in stunting in 2010 (47%). However, changes in the prevalence of wasting and overweight were small over this same time period [10].

Child nutrition is rooted in a number of factors such as households as well as communities characteristics[11]. These factors such as national and household food security, heavy maternal workload, maternal dietary diversity, HIV, children's illness, child's age are associated with child malnutrition in Malawi [12,13].

Related Literature

Malawi ranks 73rd out of 104 countries on the Global Hunger Index [14]. According to a study by Department of Disaster Management Affairs (DoDMA), Government of Malawi, and the United Nations Office in Malawi (2017), 6.5 million people, about 39% of the total population was at risk of food insecurity (FIS) in 24 of the 28 districts. However, the risk of FIS reached 6.7 million people in 2016 [15].

In a study, Sassi (2013) argued that "maize production and prices are at the center of the Malawi's food security policy, which in the recent years has contributed to accentuating supply shortages of maize on the domestic market and price increases" (P: 5). Notably, major changes in the price of maize throughout the year affect household food security. Food price is based on seasonal patterns which is dependent on rain-fed agriculture [16]. Thus, household food security

Citation: Ahmadi D. Household Food Insecurity is Associated with Children's Nutritional Status: A 2015 Cross-Sectional Study of Malawi. Austin J Nutri Food Sci. 2019; 7(7): 1131.

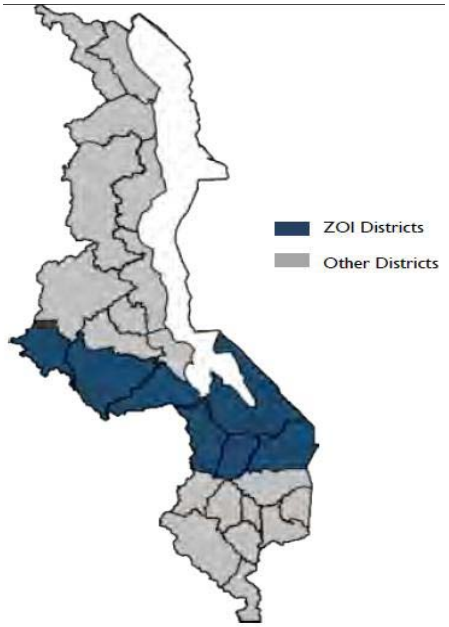

Figure 1: Map of Malawi: Feed the Future 2015, Interim Assessment Coverage area.

and child nutrition are most vulnerable to these fluctuations during the lean season (the dry, summer season September to February) [17].

Among factors influencing children's malnutrition, there are some factors such as child's age, gender, parental education, family assets, sanitation, and health service availability which play more important roles [11]. A study by De Groot et al., (2017) indicated that children's characteristics are important in explaining nutritional outcomes of children in Malawi [18]. Another study focusing on Malawi by Chikhungu et al., (2014) indicated that underweighting is increased among children with illnesses (i.e., diarrhea, lower respiratory infections, fever, stomachache and upper respiratory infection) compared to children that were not ill in Malawi [19].

In terms of maternal education, a study in Malawi has shown that stunting is significantly associated with mothers' education. Child stunting was lowest among children whose mothers had senior secondary education and above [20]. Also, another study by Arimond and Ruel (2004) indicated that the association between dietary diversity and child nutritional status might vary depending on maternal characteristics (height, BMI, education and number of prenatal care visits) [21].

Women's workloads and energy expenditure further increase the risk of child malnutrition. Women's workloads also made breastfeeding and responsive feeding difficult [22]. In fact, most of women must fetch water after giving birth, which can affect the quantity and quality of childcare practices [23].

Beside Malawian women, men's attendance in child's health has implications for child's nutrition. For instance, when men attend in health clinics, they are provided with information that encourage them to appreciate the importance of their participation in child nutrition [24].

Sanitation plays the important role in child nutrition. For instance, a study by Ruel-Bergeron et al., (2015) argued that better wash practices contribute to reduction in stunting in Malawi [25].

HIV epidemic still has an impact on child mortality in Malawi [26]. A study by Chihana et al., 2015 indicated that the prevalence of HIV was between 10-14% in Malawi (between 2006 to 2011) and around one million adults live in Malawi [27] and their children are estimated to be infected. Specifically, HIV prevalence among women in the reproductive age group was around 13% over the same time period, and 30,000 newborns were infected through mother-to-child transmission every year. In fact, child mortality is affected indirectly through maternal death or illness as a result of HIV/AIDS [28].

The main objective of this study was to explore the association between household food security status (using Household Hunger Scale (HHS)) and children's anthropometric indicators. The significance of this study was to understand how the determinants associate with all four indicators when examined together.

A number of covariates such as households' characteristic (i.e., water type, sanitation type and HH highest education category), women's dietary diversity, women's workloads, child's sex, and child's age were used to assess the associations with the aforementioned anthropometric indicators in Malawi.

Methods

Data Sources

Data were obtained from "Feed the Future Malawi Interim Survey in the Zone of Influence" [1]. "The Feed the Future ZOI in Malawi covered at baseline and in the first interim assessment includes the rural areas of seven ZOI districts in the Central and Southern regions of Malawi: Balaka, Dedza, Lilongwe, Machinga, Mangochi, Mchinji, and Ntcheu" [29]. The objective of the Malawi Feed the Future program is to sustainably reduce poverty and hunger and to improve the nutrition of women and children [1].

Sample population

"The sample for the Malawi ZOI interim assessment comprises rural areas of seven districts distributed across Central and Southern regions: Balaka, Dedza, Lilongwe, Machinga, Mangochi, Mchinji, and Ntcheu. A total of 861 households in 43 clusters were interviewed by the National Statistical Office of Malawi (NSO) in the rural areas of Dedza, Lilongwe, Mangochi, Mchinji, and Ntcheu. A total of 210 households were interviewed by ICF International in the rural areas of Balaka and Machinga (See appendix for detail of sample calculation)" (Figure 1) [29].

"The questionnaire used for the ZOI interim survey in Malawi was based on the population-based survey instrument for feed the Future ZOI indicators for the interim assessments. The questionnaire was translated into two native languages spoken by 10 percent or more of the population in the ZOI. In Malawi, the questionnaire was translated into Chichewa and Yao. The quality of the translations was assured by using a team translation approach with back translation from the main translation. Translations were incorporated into the data entry program on the tablet computers that were used for data collection in the households" [29].

Table 1: Test of data normality.

	Kolmogorov-Smirnov			Shaprio-Wilk		
	Statistics	df	sig	Statistics	df	sig
Child underweight (weight for age) Z score	0.022	821	2.00	0.996	821	0.027
Child stunting (height for age) Z score	0.310	821	0.061	0.989	821	0.000
Child wasting (weight for height) Z score	0.034	821	0.029	0.986	821	0.000
Reference: Micro data analysis from feed the Future Malawi Interim Survey in the zone of influence, 2015.						

Table 2: Household Hunger Scale (HHS) characteristics.

Q1	In the past [4 weeks/30 days], was there ever no food to eat of any kind in your house because of lack of resources to get food?	0 = No 1 = Yes
Q2	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1–2 times) 2 = Sometimes (3–10 times) 3 = Often (more than 10 times)
Q3	In the past [4 weeks/30 days], did you or any household member go to sleep at night hungry because there was not enough food?	0 = No 1 = Yes
Q4	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1–2 times) 2 = Sometimes (3–10 times) 3 = Often (more than 10 times)
Q5	In the past [4 weeks/30 days], did you or any household member go a whole day and night without eating anything at all because there was not enough food?	0 = No 1 = Yes
Q6	How often did this happen in the past [4 weeks/30 days]?	1 = Rarely (1–2 times) 2 = Sometimes (3–10 times) 3 = Often (more than 10 times)
Reference: Micro data analysis from feed the Future Malawi Interim Survey in the zone of influence, 2015		

Outcome variables

Inclusion criteria for anthropometric measurement of children were for Children under five years of age as well as children who permanently live with family members in households. Key variables to be measured in the children's anthropometric survey included sex, age, height/length and weight. Anthropometric measurements (length/height and weight) of children (5<) months of age were taken to calculate their nutritional status.

The outcome variables (as continuous z-scores) were based on children's anthropometric measurements, including underweight (weight-for-age < -2 SD), stunting (height-for-age <-2 SD), and wasting (weight-for-height < -2 SD) (Table 1) [30].

Exposure variables

The Household Hunger Scale (HHS) was used to measure households' food security status (Table 2). This index contains six items focusing on the access dimension of food security. "These questions were designed to represent varying levels of food insecurity while also reflecting three domains perceived as central to the experience of food insecurity cross-culturally: 1) anxiety about household food supply; 2) insufficient quality, which includes variety, preferences, and social acceptability; and 3) insufficient food supply and intake and the physical consequences. The frequency-of-occurrence questions ask how often a reported condition occurred during the previous 4 weeks (30 days): rarely, sometimes, or often" (Table 2). The answers were combined and based on summation. HHS was recoded as 0-1 for "food secure", 2-3 for "moderately food insecurity (FIS)", 4-6 for "severely food insecure" [31].

Factors such as, household water types, sanitation types, households' highest education level, women's age (year)(15-24, 25-29, 30-39, and 40-49), dietary diversity, child's sex and child's age (months) (0-5, 6-11, 12-23, 24-59)were selected as covariates. Major limitation of this study is lacking a question for including mothers with children. However, sample includes women who mentioned they have children younger than 5 in the household they live.

Women's dietary diversity score was used from surveys. This question is related to the consumption of starchy staples, dark green leafy vegetables, other Vitamin A-rich fruits and vegetables, other fruits and vegetables, organ meats, meat and fish, eggs, legumes, nuts and seeds, milk and milk products. Based on the summation from the above food items, a new score was produced and categorized into two groups: "0 to 3 food items" and "4 to 9 food items" (Kennedy, 2011) [30].

A question was used for women's workload in this study. This factor is important because of the adverse impact of mothers' work outside the home on the health and development of their infants [32]. Workload question was recorded into two categories: 0-500 minutes and greater than 500 minutes.

Analysis

Descriptive statistics were used to examine the frequency of dependent, independent and covariate variables. Four linear regression analyses were carried out to explore the association between household food security status (HHS) and their children's anthropometric indicators with adjustment for covariates.

Results

Child, women and household (HH) characteristics

Child, maternal and households' characteristics are presented in (Table 3). Approximately forty percent (40%) of mothers were between 15 to 24 years of age. Only ten percent (10%) of mothers had "completed secondary or more" education levels. Results for household food security status showed that fifty percent (50%) of households reported being food secure. In terms of dietary diversity, seventy-five percent (75%) of mothers ate zero to three food items. In terms of child anthropometry, around forty-two percent (26%)

Table 3: Household (HH), Women and Child (Under 5 years of age) characteristics in Malawi.

HH characteristics	Household Hunger Scale (HHS)	Little to no HH hunger (0-1)	310 (50.5)
		Moderate HH hunger (2-3)	284 (46.3)
		Severe HH hunger (4-6)	20 (3.3)
	Electricity?	Yes	13 (2.1)
	Improved Water?	Yes	526 (85.7)
	Improved Sanitation?	Yes	301 (49.0)
	HH Highest education category?	Completed secondary or more	60 (9.8)
Maternal characteristics	Maternal age groups	15-24	244 (39.2)
		25-29	129 (20.7)
		30-39	201 (32.3)
		40-49	48 (7.7)
	Education	Completed secondary or more	30 (4.9)
	Dietary diversity	Meets minimum dietary diversity (4-9)	149 (24.1)
	Workload	0-500 min	248 (41.1)
	BMI	Normal (18.5<=BMI<25)	451 (79.5)
Child characteristics	Sex	Girls	404 (47.9)
		Boys	439 (52.1)
	Age (months)	0-5	83 (9.9)
		6-12	92 (10.9)
		13-24	171 (20.3)
		25-59	496 (58.9)
Anthropometric indicators	Child underweight (weight for age) Z score	(-2)	138 (16.6)
		(-3)	22 (2.7)
	Child stunting (height for age) Z score	(-2)	348 (42.1)
		(-3)	116 (14.0)
	Child wasting (weight for height) Z score	(-2)	30 (3.7)
		(-3)	5 (0.6)

Reference: Micro data analysis from feed the Future Malawi Interim Survey in the zone of influence, 2015.

of children were stunted (-2SD) and sixteen percent (12%) were underweight.

Linear Regression analysis of the association between Household Hunger Scale (HHS) with stunting, wasting, and under weight (Table 4).

Underweight (weight for age)

HHS was significantly associated with underweight (Beta= -0.087; 95% CI (0.296; -0.013)). However, results of the covariates showed that improved sanitation (Beta= 0.092; 95% CI (0.025; 0.341)), household highest education category (Beta= 0.182; 95% CI (0.148; -0.373)), and child's age (Beta= -0.179; 95% CI (-0.258; -0.117)) were also significantly associated with underweight (Table 4).

Stunting (height for age)

No significant association was observed between HHS and stunting status. However, improved sanitation (Beta= 0.083; 95% CI (0.008; 0.392)), household highest education category (Beta= 0.126; 95% CI (0.082; -0.356)) child's sex (Beta= -0.094; 95% CI (-0.430; -0.069)), and child's age (Beta= -0.279; 95% CI (-0.457; -0.283)) were found significantly related to stunting (Table 4).

Wasting (weight for height)

Similar to the stunting, HHS was not significantly associated with wasting; however, household highest education category (Beta= 0.131; 95% CI (0.077; -0.317)) and women dietary diversity (Beta= 0.085; 95% CI (0.013; -0.408)) remained significant with wasting (Table 4).

Results for adjusted model are presented in (Table 5). Findings showed that after adjusting controlling variables, household highest education category (Beta= 0.138; 95% CI (0.076; -0.316)) and child's age (Beta= 0.146; 95% CI (-0.260; -0.073)) were significantly associated with underweight status. Similarly, stunting status was significantly associated with household highest education category (Beta= 0.101; 95% CI (0.031; -0.319)), child's sex (Beta= -0.104; 95% CI (-0.444; -0.059)), and child's age (Beta= -0.226; 95% CI (-0.437; -0.208)). Furthermore, among the controlling factors, only household highest education category (Beta= 0.089; 95% CI (0.004; 0.263)) remained significant with wasting status.

Discussion

The main objective of this study was to investigate the association

Table 4: Unadjusted linear regression analyses between anthropometric indicators and HHS and adjusting covariates (n=821).

	Underweight (weight for age)		**Stunting** (height for age)		**Wasting** (weight for height)	
	Beta	95% CI L-H	Beta	95% CI L-H	Beta	95% CI L-H
Household Hunger Scale	**-0.087***	-0.296; -0.013	-0.045	-0.270; 0.076	-0.072	-0.286; 0.015
Improved water	0.074	-0.017; 0.433	0.044	-0.125; 0.425	0.050	-0.091; 0.386
Improved Sanitation?	**0.092***	0.025; 0.341	**0.083***	0.008; 0.392	0.043	-0.078; 0.257
HH highest education category	**0.182*****	0.148; 0.373	**0.126****	0.082; 0.356	**0.131*****	0.077; 0.317
Women dietary diversity	0.049	-0.071; 0.300	-0.005	-0.242; 0.211	**0.085 ***	0.013; 0.408
Women Workload	0.041	0.000; 0.001	0.066	0.000; 0.001	-0.010	-0.001; 0.000
Child Sex	-0.054	-0.259; 0.030	**-0.094****	-0.430; -0.069	0.010	-0.130; 0.176
Child age (mons)	**-0.179*****	**-0.258; -0.117**	**-0.279*****	-0.457; -0.283	-0.017	-0.096; 0.058
Reference: Micro data analysis from feed the Future Malawi Interim Survey in the zone of influence, 2015.						

Table 5: Adjusted linear regression analyses between anthropometric indicators and HHS by adjusting covariates (n=821).

	Underweight [a.] (weight for age)		**Stunting** [b.] (height for age)		**Wasting** [c.] (weight for height)	
	Beta	95% CI L-H	Beta	95% CI L-H	Beta	95% CI L-H
Household Hunger Scale	-0.025	-0.192; 0.104	-0.005	-0.190; 0.168	-0.028	-0.212; 0.108
Improved water	0.076	-0.016; 0.430	0.043	-0.125; 0.413	0.054	-0.084; 0.397
Improved Sanitation?	0.066	-0.0131; 0.290	0.053	-0.065; 0.321	0.036	-0.099; 0.247
HH highest education category	**0.138****	0.076; 0.316	**0.101***	0.031; 0.319	**0.089***	0.004; 0.263
Women dietary diversity	0.023	-0.142; 0.248	-0.014	-0.274; 0.195	0.058	-0.068; 0.354
Women Workload	0.016	0.000; 0.001	0.055	0.000; 0.001	-0.034	-0.001; 0.000
Child Sex	-0.044	-0.246; 0.073	**-0.104***	-0.444; -0.059	0.036	-0.099; 0.247
Child age (mons)	**-0.146*****	-0.260; -0.073	**-0.226*****	-0.437; -0.208	-0.004	-0.108; 0.098

between household food security status and child anthropometric indicators. Descriptive findings indicated that prevalence of stunting (height-for-age) was high. The results of this study are in line with Demographic Health Survey, which likewise find that Malawi has one of the highest rates of stunting in Africa [33].

Findings from this study found that household food security status was significantly associated with underweighting (weight-for-age). However, the strength of association was weak. Available studies have found that the severity of food insecurity affects nutrition status [34]. For instance, Humphries et al, (2015) reported lower height-for-age Z-scores for children living in food insecure homes and postulated that this association was mediated by dietary diversity [35].

Child's sex was significantly associated with stunting. Results from this study indicate that boys were more likely to be stunted compared to girls. The results align with data from the Food and Agriculture Organization [36] which demonstrate that boys are more likely to be stunted than girls in Malawi. Other studies have also found that boys are more likely to be under weight estimates compared to girls [37].

A significant relationship was found between child's age and child's anthropometric indicators specifically stunting and underweight. These findings concur with existing literature that has reported child's age is an important determinants of child malnutrition [18,38].

Previous studies indicated that maternal education has a considerable impact on child health and on child mortality rates, specifically for children under two years of age [39]. A study by Makoka and Masibo (2015) indicated that stunting is significantly related to maternal education level and low education levels increase the odds of child stunting, wasting and underweight [20]. This study did not find a significant association between maternal education and children's anthropometric indicator. However, HH highest education category was found significantly associated with all anthropometric indicators.

Women's workload times were not significantly associated with child anthropometric indicators. However, available studies have showed that the time spent fetching water has been found to be a significant determinant of young children's (under five years of age) health status [40]. Reduction in water fetching time affords women more time to engage in income-generating activities, which improve their household income. Thus, socioeconomic factors, and household income specifically might be associated with child's health status.

A greater dietary diversity may be indicative of less severe food insecurity, and dietary diversity is generally considered a promising indicator of food security status [41]. However, in this study, the association between dietary diversity and wasting did achieve significance difference. Since certain foods, like maize, are more available at certain times of the year, the diet may be dominated predominately by this food crop or similar foods, thereby reducing dietary diversity, while improving food security. For instance, a report in Malawi (2017), indicated that at the beginning of lean season, food security status continues to be almost favorable at the national level.

Because families consume their own productions and they have stable access to market. For instance, households can sell excess maize and use the money to buy foods at the market. However, some districts (i.e., Nsanje, Chikwawa, Mwanza, and Balaka) in Malawi experience localized dry spells and pest attacks [42].

The major limitation of this study was the use of cross-sectional data, which only provides information collected at a specific point in time and is not necessarily reflective of results over time. Moreover, the cross-sectional nature of the analysis does not allow for the estimation of casual effects, nor does it eliminate the possibility of reverse causality. Farming communities in Malawi may be more affected by access to seasonal food at different times of the year, making temporal considerations important. It is also important to note that food security and dietary diversity measures are self-reported; and therefore, results may vary from household to household. Future research should apply causal methods to investigate the impact of food security and dietary diversity on anthropometric indicators. Nevertheless, the findings of this study can inform and influence health and nutrition policy decisions at the community and national levels in Malawi by establishing maternal food security experience as a key indicator of children's health. Further, this study lacked these variables such as income and diseases like diarrhea.

Conclusion

Results from this study revealed that household food security status in this population is associated with underweight. Moreover, this study identified several covariates, including household's highest education category, children's age and sex, which may be important factors to consider when estimating associations between food security and children's nutrition status.

References

1. Amugsi D, Dimbuene Z, Kimani-Murage E, Mberu B, Ezeh A. Differential effects of dietary diversity and maternal characteristics on linear growth of children aged 6–59 months in sub-Saharan Africa: a multi-country analysis. Public Health Nutrition. 2017; 20: 1029-1045.
2. Akombi B, Agho K, Merom D, Renzaho A, Hall J. Child malnutrition in sub-Saharan Africa: A meta-analysis of demographic and health surveys (2006-2016). PloS One. 2017; 12: e0177338.
3. Teller C, Alva S. Reducing child malnutrition in sub-Saharan Africa: surveys find mixed progress.
4. Muzigaba M, Kigozi G, Puoane T. Short-term and sustained effects of a health system strengthening intervention to improve mortality trends for paediatric severe malnutrition in rural South African hospitals. South African Journal of Child Health. 2017; 11: 38-45.
5. Bain L, Awah P, Geraldine N, Kindong N, Siga Y, Bernard N, et al. Malnutrition in Sub–Saharan Africa: burden, causes and prospects. Pan African Medical Journal. 2013; 15: 120.
6. INDEPTH. Anthropometric Status Indicators.
7. CDC. About Child & Teen BMI.
8. Ziba M, Kalimbira A, Kalumikiza Z. Estimated burden of aggregate anthropometric failure among Malawian children. South African Journal of Clinical Nutrition. 2017; 31: 43-46.
9. FAO. The Cost of Hunger in Malawi.
10. DHS. Malawi Demographic and Health Survey. 2015-2016.
11. Kumchulesi G. Persistence of Child Malnutrition in Malawi: Explanations from Demographic and Health Surveys. Journal of African Development. 2018; 19: 69-75.
12. Chirwa E, Ngalawa H. Determinants of child nutrition in Malawi. South African Journal of Economics. 2008; 76: 628-640.
13. Preedy V, Hunter L-A, Patel V. Diet quality: an evidence-based approach. UK: Springer Science & Business Media. 2013.
14. Gelli A, Aberman NL, Margolies A, Santacroce M, Baulch B, Chirwa E. Lean-Season Food Transfers Affect Children's Diets and Household Food Security: Evidence from a Quasi-Experiment in Malawi–5. The Journal of Nutrition. 2017; 147: 869-878.
15. DoDMA, GOM, UN. Malawi: Food Security.
16. Sassi M, editor Child Nutritional Status in the Malawian District of Salima: A Capability Approach. 2013 Second Congress, June 6-7, 2013, Parma, Italy; 2013: Italian Association of Agricultural and Applied Economics (AIEAA).
17. Ellis F, Manda E. Seasonal food crises and policy responses: A narrative account of three food security crises in Malawi. World Development. 2012; 40: 1407-1417.
18. De Groot R, Handa S, Ragno LP, Spadafora T. Child Malnutrition, Consumption Growth, Maternal Care and Price Shocks.
19. Chikhungu LC, Madise NJ. Seasonal variation of child under nutrition in Malawi: is seasonal food availability an important factor? Findings from a national level cross-sectional study. BMC Public Health. 2014; 14: 1146.
20.
21. Makoka D, Masibo PK. Is there a threshold level of maternal education sufficient to reduce child undernutrition? Evidence from Malawi, Tanzania and Zimbabwe. BMC pediatrics. 2015; 15: 96.
22. Arimond M, Ruel MT. Dietary diversity is associated with child nutritional status: evidence from 11 demographic and health surveys. The Journal of Nutrition. 2004; 134: 2579-2585.
23. Tanaka J. Care Groups in Emergencies in Unity State, South Sudan. South Sudan Medical Journal. 2017; 10: 46-47.
24. Dufaut A. Women carrying water: how it affects their health. Waterlines. 1988; 6: 26-28.
25. Mkandawire E, Hendriks S. A qualitative analysis of men's involvement in maternal and child health as a policy intervention in rural Central Malawi. BMC Pregnancy and Childbirth. 2018; 18: 37.
26. Ruel-Bergeron J, Christian P, Hurley K, Monclus M, Phuka J, Wu L, et al. Water, Sanitation and Hygiene (WASH) and Breastfeeding Contribute to Child Stunting in Rural Malawi. The FASEB Journal. 2015; 29: 579-600.
27. Jahn A, Floyd S, McGrath N, Crampin A, Kachiwanda L, Mwinuka V, et al. Child mortality in rural Malawi: HIV closes the survival gap between the socio-economic strata. PLoS One. 2010; 5: e11320.
28. USAID. Malawi.
29. Chihana M, Price A, Floyd S, Mboma S, Mvula H, Branson K, et al. Maternal HIV status associated with under-five mortality in rural Northern Malawi: a prospective cohort study. Journal of Acquired Immune Deficiency Syndromes (1999). 2015; 68: 81-90.
30. Feed the Future FEEDBACK. 2015. Feed the Future Malawi 2015 Zone of Influence Interim Assessment Report. Rockville, MD: Westat.
31. Kennedy G, Ballard T, Dop MC. Guidelines for measuring household and individual dietary diversity. Food and Agriculture Organization of the United Nations. 2011.
32. Ballard, T., Coates, J., Swindale, A., Deitchler, M. (2011). Household hunger scale: indicator definition and measurement guide. Washington, DC: Food and Nutrition Technical Assistance II Project, AED.
33. Rabiee F, Geissler C. The impact of maternal workload on child nutrition in rural Iran. Food and Nutrition Bulletin, 1992; 14: 1-6.
34. WFP. Progress On Stunting Prevention In Malawi.
35. Mutisya M, Kandala N, Ngware MW, Kabiru C. Household food (in) security

and nutritional status of urban poor children aged 6 to 23 months in Kenya. BMC Public Health. 2015; 15: 1052.

36. Humphries D, Dearden K, Crookston B, Fernald L, Stein A, Woldehanna T, et al. Cross-sectional and longitudinal associations between household food security and child anthropometry at ages 5 and 8 years in Ethiopia, India, Peru, and Vietnam. The Journal of Nutrition. 2015; 145: 1924-1933.

37. FAO. Nutrition Country Profile Republic of Malawi.

38. Komonen R. Mother's perception of her child's growth in rural Malawi.

39. Chikhungu LC, Madise NJ, Padmadas S. How important are community characteristics in influencing children' s nutritional status? Evidence from Malawi population-based household and community surveys. Health & Place. 2014; 30: 187-195.

40. Natarajan V, Devaki P. Does Maternal Education Really Improve Child Health? Journal of Dental and Medical Sciences. 2013; 4: 7-9.

41. Pickering A, Davis J. Freshwater availability and water fetching distance affect child health in sub-Saharan Africa. Environmental Science & Technology. 2012; 46: 2391-2397.

42. Faber M, Schwabe C, Drimie S. Dietary diversity in relation to other household food security indicators. International Journal of Food Safety, Nutrition and Public Health. 2009; 2: 1-15.

43. FEWSNET. Malawi: Overall favorable food security conditions to prevail across the country until the next harvest.

Austin J Nutri Food Sci - Volume 7 Issue 7 - 2019
ISSN : 2381-8980 | www.austinpublishinggroup.com

Citation: Ahmadi D. Household Food Insecurity is Associated with Children's Nutritional Status: A 2015 Cross-Sectional Study of Malawi. Austin J Nutri Food Sci. 2019; 7(7): 1131.