Household Food Security is associated with Stunting among Preschool Children in Occidental Mindoro

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RESEARCH ARTICLE

Abstract

Background and Objective: Food security is achieved when the population at all times has access to safe, sufficient and nutritious food to sustain a healthy and active life. This study aimed to determine significant association between household food security and stunting among preschool children in Occidental Mindoro. Specifically, this study was conducted to determine the prevalence of stunting among preschool children and household food security in the study area.

Methods: This study utilized cross- sectional study design and a three level multi- stage, stratified random sampling to answer the study objectives. A total of 480 preschool children (n=240 urban; n= 240 rural) were included in the study. Radimer-Cornell Tool was used to determine the food security status of the household. A validated- constructed questionnaire was used to determine other factors which were controlled in this study. Multiple Logistic Regression was used to determine significant association between the exposure and the outcome variable while controlling confounding variable simultaneously.

Results and Discussion: Result of this study revealed that the prevalence of food insecurity in the province was 51. 04% (95% CI: 46.55, 55.53) while prevalence of stunting was 36.04% (95%CI: 31.73, 40.35). Meanwhile, after controlling the confounding effect of household income and low dietary diversity score it was found that the odds of having a stunted child were 23 times higher among food insecure households (OR: 23.00, 95%CI: 12.05, 43.91).

Conclusion: Based from the result of this study, magnitude of household food insecurity and stunting were found to be very high in the study areas. There was a significant association between household food security and stunting among preschool children.

Keywords: *stunting, preschool children, household food security*

Introduction

Food security is attained when all people at all times have access to sufficient, safe and nutritious food to maintain healthy and active life [1]. This concept includes both physical and economic access to food that meets people's dietary needs as well as their food preferences. It involves the following dimensions: physical availability of food, economic and physical access to food, food utilization and stability of the other dimensions. Stability of other dimensions must not be affected negatively by natural, social, economic or political factors to ensure that food security will exist among the population.

At present, eight hundred forty two (842) million people or twelve per cent (12%) of the population around the globe were food insecure [2]. Majority of food insecurity exists in developing and underdeveloped countries which are mostly concentrated in the Sub- Saharan Africa and South East Asian nations. Approximately one hundred sixty seven (167) million people in Eastern Asia, two hundred twenty three (223) million people in Sub- Saharan Africa and two hundred ninety (290) million in Southern Asia are food insecure [2].

In the Philippines, the 8th National Nutrition Survey (NNS) revealed that more than a quarter of Filipino adults or thirty six per cent (36%) and twenty three per cent (23%) of children

claimed to be food insecure respectively. The magnitude of the problem was persistently scattered across the sixteen (16) regions of the country [3]. According to the first quarter 2016 Social Weather Survey, forty six per cent (46%) or 10.5 million of Filipino families classified themselves as poor. The average hunger rate last 2015 was recorded at thirteen per cent (13%) lower compared to 2014 with average hunger rate at eighteen per cent (18%). Two million (2) Filipino families experienced moderate food hunger and six hundred twenty one thousand (621,000) Filipino families suffered from severe hunger [7].

Meanwhile, food security in the household level is a prerequisite of a well- nourished child. However several studies already proved that not all food secure households have healthy children. A number of studies from longitudinal and prospective studies yielded heterogeneous results [8].

Stunting is a cumulative process that starts in utero and there is substantial evidence that intrauterine growth is a strong predictor of postnatal growth. Several studies have shown that growth faltering in infants starts from seven months upward because breastmilk is no longer enough to meet the child's nutritional requirement.

Among the regions in the Philippines, prevalence of stunting were higher among rural areas and in the poorest quintiles. Stunting was more common among preschool children in Bicol (39.8%), ARMM (39.0%) and Zamboanga Peninsula (38.7%) [3].

Stunting and household food insecurity were both problematic issues that greatly affect the developmental period of preschool children. Skeletal growth of preschool children is very vulnerable to different conditions such as genetic predisposition, nutrition and dietary intake among others. In the study conducted in Colombia, it was revealed that household food insecurity is significantly associated with stunting [6]. In another study conducted in the North Eastern Peninsular Malaysia [4], it was found out that children who were food insecure were three times more likely to be stunted (p=.004). In another study conducted in Pakistan, association between household food insecurity and stunting of preschool children was statistically significant [5].

Undernutrition must be addressed with appropriate and immediate intervention because this may lead to weakened immune system thereby increasing the susceptibility to infections, poor growth and development and other related complications of malnutrition [3]. Thus, sufficient and appropriate intervention must be done especially in most afflicted provinces and municipalities [3].

Even though household food insecurity and stunting were challenges the country had been experiencing for the last few decades, only few studies explored the relationship and association between these two concepts. The association of household food insecurity and stunting among preschool children in the Philippines has not been studied specifically among poorest provinces. Furthermore, the limited number of studies regarding this phenomenon, specifically how food security affects the skeletal growth of children calls for the conduct of a methodologically sound and valid study.

The main objective of this study was to determine significant association between household food security and stunting among preschool children in Occidental Mindoro. Specifically, this study aimed to determine the prevalence of household food security and stunting among preschool children in the study area.

Methodology

Study Design

The study utilized analytic cross sectional study design to determine the association of household food security and stunting among preschool children. This was used to gather information on the exposure (household food security) and outcomes (nutritional status: stunting) simultaneously at a single point in time. The use of a cross-sectional design allowed to examine several outcomes and evaluate a variety of risk factors.

Study Setting and Target Population

Occidental Mindoro, an island province under Region IV-B (Mindoro, Marinduque, Romblon and Palawan) (MIMAROPA), was used as the setting of this study. This province mainly consists of agricultural lands and surrounded with bodies of water. The agricultural landscape of the province make it suitable for farming and fishing industry. Tagalog is the dialect mostly used in the whole province. The target population of this study were preschool children who were currently enrolled in Barangay Day Care centers. This province was selected as the study setting because the NNS results of FNRI showed that MIMAROPA is one of the regions with high prevalence of household food insecurity in the Philippines.

Sampling Design

A total of 480 preschool children were included in this study. This was determined through the use of Open Epi

software. Three level multi- stage stratified simple random sampling was utilized in this study. At the start of this sampling design, all municipalities of Occidental Mindoro except island municipalities were included on the list. Only three (3) municipalities were drawn from the sampling frame in order to maximize resources during data collection. After the municipalities were selected, barangays were stratified into two namely: urban and rural barangays. The stratification was based on the list of barangay classification set by the Department of Interior and Local Government [9].

According to PSGC, all barangays with a population density of atleast 500 to 1,000 persons per square kilometer were considered as urban barangays. Furthermore, a barangay can be classified as urban barangay if there is a street pattern or network of streets and there is at least six establishments within the vicinity (commercial, recreational, etc). The availability of town hall, church, public plaza, places and building identify a barangay as urban regardless of the population density. Lastly, a barangay shall be classified as urban if at least 1,000 of the inhabitants is predominantly non- fishing or farming. Nevertheless, all of the barangays which doesn't fit the criteria were classified as rural [9].

From each stratum, only eleven (11) barangays were selected through simple random sampling in order to meet the sample size requirement. It was done because the number of preschool children from each center did not exceed thirty- five (35). Only center- based day care institutions were included in the study. After the barangays had been selected, lists of pre-school children were asked from the day care workers which served as final sampling frame.

From the list, twenty-one (21) preschool children were selected through a systematic random sampling. Thus, only twenty (21) preschool children attending each respective day care center were included and students were chosen through the use of simple random sampling. The conduct of this study was approved by the University of the Philippines- Manila, Research Ethics Board with protocol code UPMREB 2016- 315- 01.

Data Collection Procedure

Letter of intent was sent to the Provincial Social Welfare and Development Office (PSWDO) to seek approval of data collection implementation. Upon approval, endorsement was done through the respective Municipal Social Welfare and Development Office (MSWDO) of each municipality. A letter of endorsement was released by the MSWDO to each barangay for data collection.

Signing of informed consent written in Tagalog was administered before the data collection. Collection of data lasted for thirty to forty minutes from the time of signing the informed consent until the completion of all components.

Data Collection Tool

The tool was composed of three parts: (1) General Information, (2) Anthropometric and dietary assessment and (3) the adapted Radimer- Cornell Tool of household food security. Radimer- Cornell is originally a 6- item measure of hunger and food insecurity [10]. Food security items in the adapted Radimer-Cornell measure of food insecurity were valid indicators of food insecurity using national estimates. Even though individual level of food insecurity showed a higher proportion of the total variance compared to household level items, this does not preclude the ability of the tool to detect food insecurity at household level. In this study, adapted tool was based on the actual questions employed by the FNRI during the NNS [11].

General information and Radimer-Cornell Tool were employed though direct interview among mothers and caregivers of preschool children during data collection. Height of the preschool children was measured through the use of height board and microtoise. The World Health Organization's Child Growth Standards (WHO CGS) was used to interpret the result of the height-for-age status.

Dietary inadequacy was identified as an intermediate variable between household food security and stunting [12,13]. In this study, individual dietary diversity scores (IDDS) had been used to measure the adequacy of the diet.

Studies in different age groups have shown that an increase in individual dietary diversity score was related to increased nutrient adequacy of the diet [14, 15]. The DDS and its food groupings was based on the Food Agriculture Office (FAO) guidelines [17]. The reference for DDS was a 24- hour food recall answered by the mother or caregiver of the child. The result of the recall was tallied based on the set food groupings [17].

In order to assess the intake of the respondents, cut-off of ≥5 food groups had been used to determine adequacy. It was found out that the best cut-off point to maximize the specificity and sensitivity of the DDS for preschool children

in the Philippines was five (5) [17]. A score of ≥5 in the IDDS reflects adequacy of the diet among preschool children.

Data Encoding and Data Editing

To ensure that the information gathered were complete, consistent and suitable for data analysis; data were examined during coding, encoding and editing. The data gathered were encoded using Microsoft Excel and edited using Stata to ensure the accuracy and correctness of the figures before proceeding to data analysis.

In order to answer the objective of this study, ratio and proportion using the point and interval estimate were used to determine the prevalence of household food insecurity and stunting among preschool children. Multiple logistic regression was used to determine the association between the exposure and outcome variable in order to control confounder and since the exposure and outcome variable of interest are in categorical type. Moreover, multiple logistic regression was utilized in order to control the effect of confounding variable in the association of the exposure and the outcome.

Results

Three municipalities of Occidental Mindoro included in this study were: municipalities of Sablayan, Mamburao and Abra de Ilog. Six (6) barangays from Sablayan (3 rural barangays and 3 urban barangays), eight (8) barangays from both Abra de Ilog and Mamburao respectively (4 rural and 4 urban barangays) were included in the study.

Description of Participants

The characteristics of participating household and preschool children were summarized in Table 1. A total of four hundred- eighty (480) 3-5 year- old children participated in the study, 240 from rural communities and 240 from the urban communities. The mean age of the respondents was 52.6 ± 8.15 months. Almost half (47%) were boys and the remaining 53% were girls.

Among the 480 households included in the study, majority (69%) had monthly income of PHP. < 6,000.00. Twenty three per cent (23%) had monthly income between PHP. 6,001.00 to 15, 000.00 and the remaining 8% had monthly income greater than PHP. 15, 0001.00.

Common occupation and livelihood of the fathers included the following: farmer (31%), fisherman (20%), driver (14%), contractual employee (8%), Overseas Filipino Worker (OFW) (8%) and the remaining 10% were unemployed. On the other hand, common occupation of mothers included the following: housekeeper (76%), contractual employee (6%) and vendor (5%), OFW (3%), government employee (3%) and housemaid (3%).

Majority (71%) of the preschool children belong to a household not covered by any government programs such as Conditional Cash Transfer (CCT) - Pantawid Pamilyang Pilipino Program (4Ps) and Minority Condition Cash Transfer (MCCT). Almost all (96%) of the respondents were non-Mangyan. Mangyan is the major tribe or ethno- linguistic classification in the province.

About third (30%) preschool children belong to a household with a family size of four (4). The mean household size for both rural and urban communities in Occidental Mindoro was 4.83 ± 1.35 across the three municipalities. The mean household size in rural communities in the province was 4.85 ± 1.35 higher compared to the mean household size in urban communities which was 4.80 ± 1.33.

Among the 480 preschool children who participated in the study, forty seven per cent (47%) were afflicted by diseases such as common flu, cold and acute diarrhea for the past three months. However, this variable was controlled in the study during the statistical analysis and was found as insignificant confounding variable for both underweight and (0.055 > 0.05) stunting (0.056 > 0.05) in the full model.

Based from Table 1, majority of the fathers in this study were involved in farming (31%) and fishing (20%). Occupation of other fathers included: driver, contractual employee and Overseas Filipino Worker (OFW). However, 10% of the fathers were found to be unemployed across the three municipalities.

Prevalence of Household Food Insecurity and Stunting in Preschool Children

Table 2 summarizes the prevalence of household food insecurity and stunting in Occidental Mindoro. The prevalence of household food insecurity across the three municipalities was 51.04% (95% CI: 46.55% to 55.53%). The mean household size of food insecure household was 5.11 ± 1.35 which was higher compared to mean household size of food secure household which was recorded at 4.53 ± 1.27. In addition, they also belong to households with monthly income below PHP. 6, 0000.00.

Table 1. *The prevalence of household food insecurity and stunting in Occidental Mindoro (2016)*

Characteristics	No. n=480	Percent (%)
Demography		
Sex		
Male	226	47
Female	254	43
Socio- economic		
Household Income		
<PHP. 6000.00	329	69
PHP. 6,001.00- PHP. 15,000.00	108	23
PHP. 15, 001.00- PHP. 25,000.00	35	7
>PHP. 25,001.00	8	2
Occupation of Father		
Construction Worker	48	10
Driver	66	14
Contractual Employee	38	8
Farmer	147	31
Fisherman	94	20
Government Employee	22	5
OFW	14	9
Unemployed	47	10
Others	4	1
Occupation of Mother		
Contractual Employee	29	6
Government Employee	16	3
Housemaid	16	3
OFW	16	3
Farmer	5	1
Vendor	26	7
Housewife	365	76
Others	7	1
Ethno- linguistic Classification		
Mangyan	21	4
Non- Mangyan	459	96
Recipient of Government Support		
Yes	138	29
No	342	71
Mean Age (in months)	52.6 months ± 8.15 months	
Household Size	4.83 ± 1.35	

The characteristics of participating household and preschool children were summarized in Table 1. A total of 480 3-5 year-old children participated in the study: 240 from rural communities and 240 from the urban communities.

Table 2. *Prevalence of food insecurity and stunting in Occidental Mindoro, 2016*

Factors	n	Prevalence %	Confidence Interval (95%)
Household Food Insecurity	245	51.04	46.55%; 55.53%
Stunting	173	36.04	31.73%; 40.35%

In relation to this, Table 3 presents the prevalence of stunting in Occidental Mindoro; this also explained the characteristic of household with stunted children. The factors presented in Table 3 were the covariates controlled in this study to determine significant association between household food insecurity and stunting. The prevalence of stunting in the province was 36.04% (95%CI: 31.73% to 40.35%). Meanwhile, some (21%) of stunted children received support from the government such as CCT and MCCT and the remaining 15% were not recipients of any government programs. Majority (29%) of the stunted children belonged to households with monthly income of less than PHP. 6,000.00. Meanwhile, all (100%) of Mangyan preschool children were stunted.

Ninety per cent (90%) of stunted children were found in food insecure households. Furthermore, 80% of the stunted children belonged to households with monthly family income

Table 3. *Characteristics of stunted children in terms of covariates controlled in this study*

Characteristics	Stunted n=173 n(%)	Normal n=307 n(%)	Total n=480 n(%)
Food Security			
Food Insecure	156(90)	89(29)	245(51)
Food Secure	17(10)	218(71)	235(49)
Diet Adequacy			
Less Diverse	87(50)	65(21)	152(32)
More Diverse	86(50)	24(79)	328(68)
Recipient of Government Support			
Yes	101(58)	241(79)	342(71)
No	72(42)	66(21)	138 (29)
NoSick for the Past 3 months			
Yes	91(53)	130(42)	221(46)
No	82(47)	177(58)	259(54)
NoSocio- economic			
Household Income			
<PHP. 6000.00	138(80)	191(62)	329(69)
PHP. 6,001.00-PHP.15,000.00	30(17)	78(25)	108(23)
PHP. 15, 001.00- PHP. 25,000.00	4(2)	31(10)	35(7)
>PHP. 25,001.00	1(1)	7(3)	8(2)
Ethno- linguistic Classification			
Mangyan	21(12)	0	21(4)
Non- Mangyan	152(88)	307(100)	459(96)
Family Size			
<5	67(39)	157	224(47)
5	46(27)	69	115(24)
>5	60(35)	81	141(29)

Table 3 presents the characteristic of the children based from the result of height-for- age status when grouped according to covariates. Covariates were based on the confounding variables controlled in the study.

below PHP 6,000.00. Most (27%) of the stunted children belonged to families with household size of four and five.

Association of Household Food Security Status with Nutritional Status of Preschool Children

Table 4 presents the summary of results between the association of household food security and stunting among preschool children. Multiple Logistic Regression was used to determine if there was an association between household food security status and stunting among preschool children. This study found out that after controlling the confounding effect of low dietary diversity score and household income, it was found that the odds of being stunted among preschool children were twenty- three (23) times higher if the household was food insecure (OR: 23.00, 95%CI: 12.05 to 43.91). Moreover, controlling for the confounding effect of low dietary diversity score and household income, research findings also showed that the odds of having a stunted child were 96% lower if the household was food secure.

Discussion

Prevalence of Household Food Insecurity in Occidental Mindoro

People suffering from hunger in the Philippines were mainly children and women. According to the latest result of NNS, national estimate for food insecurity in the Philippines using the Radimer- Cornell was at 69.3%. Meanwhile, the estimated prevalence of food insecurity in Occidental Mindoro was 85.8% {3}. The result of NNS was higher compared to the result of this study. The estimated prevalence (51.04) of food insecurity in this study was lower in both national and provincial estimate [95% CI: 46.55, 55.53].

In relation to other studies, fourth quarter 2015 Social Weather Survey, found an 11.7% or an estimated 2.6 million Filipino households suffering from involuntary hunger for at least once during the past three months. However, this hunger rate is the lowest average hunger rate since 2004 if compared to 11.8% average of the said year [7]. If the results of this study will be compared, it recorded lower estimates since this survey reflected the hunger rate and involuntary hungers while the present study focuses on household food security rates. Even though, the estimated prevalence in this study was lower compared to the results of NNS, the result still presented high public health significance.

Prevalence of Stunting in Occidental Mindoro

According to OPT Plus Report (2015), the recorded prevalence of stunting (height-for-age indicator) was at 22.03% for the whole province. Municipalities of Abra de Ilog (with prevalence of 45.54%), Paluan (with prevalence of 42.50%) and Sta. Cruz (with prevalence of 27.86%) were the top three municipalities with highest prevalence of stunting in the province [18].

The findings of this study suggested that the prevalence of stunting in the province was 36.04% (95%CI: 31.73% to 40.35%). Thirty per cent (30.3%) of children under 5 years old were suffering from stunted growth in the same year which places the country ninth in the world rankings of stunted children [3]. Findings of this study suggested that the prevalence of stunting among preschool children in Occidental Mindoro was at 36.04% which was almost close to the national prevalence. Meanwhile, according to the result of the NNS prevalence of stunting in Occidental Mindoro was found to be at 37.42% being highest in the MIMAROPA region.

Table 4. *Odds Ratio for the association between household food security and stunting among preschool children in Occidental Mindoro, 2016.*

Food Security Status	No. of Stunted/ No. of Preschool Children (%)	Crude OR (95% CI)	p- value	Adjusted OR (95% CI)	p-value
Insecure	156/245(64)	22.48 (12.86; 39.27)	<.001	23.00 (12.05; 43.91)	<0.001
Secure	17/235(7)				

Table 4 discusses that after controlling the confounding effect of low dietary diversity score and household income, it was found that the odds of being stunted among preschool children were twenty- three (23) times higher if the household was food insecure (OR: 23.00, 95%CI: 12.05 to 43.91).

However, the result of the Operation Timbang Plus (OPT) (2015) indicated lower prevalence across the whole province. The prevalence of stunting in the province according to OPT+ was only recorded at 22.03%. The variation in the result from different studies might be attributed to the difference in sampling design used and type of tool used during the data collection procedure [18].

Based from the result of this study, it can be determined that prevalence of stunting in the province was of high public health significance. Despite of the measures implemented by the local government unit as mandated by the Philippine Plan of Action for Nutrition, stunting was persistent across the province.

Association between Household Food Security Status and Stunting

Prevalence of stunting was lowest in food secure households and highest in severely food- insecure households in Bangladesh and Ethiopia and in moderately food- insecure households in Vietnam. The differences in undernutrition prevalence between food secure and insecure households were highly significant in the previous study ($p<0.001$) [19].

As shown in Table 3 of this study, out of 173 preschool children who were stunted, 156 (90%) belongs to food insecure household.

Moreover, result of this study revealed that 80% (137) preschool children belongs to the family with household income below Php. 6,000.00. Economic resources of a household greatly affect the capacity of the family to purchase food and other food supply which pertains to the food accessibility domain of food security. In order to achieve food accessibility, the household must be able to acquire or buy foods available through their economic resources. It is found out that children who skipped or reduced meals because of insufficient finances were significantly more likely to be wasted (OR= 4.359, CI= 1.71- 11.07) and underweight (OR= 4.177, CI= 1.96- 8.86) [20].

*I*n connection with other studies, children in food insecure households had 1.5 greater odds of being stunted than children in food- secure households in all three countries (Bangladesh, Vietnam and Ethiopia) [19]. There were substantial evidences indicating that household food security was among the key determinants of nutritional status of children [21] and food security may be a necessary requirement for good nutrition outcomes [22].

The association of household food security in the nutritional status of preschool children can be affected by several factors that include government support, community classification, ethno-linguistic classification and family household size. These other determinants were controlled in this study through the use of multiple logistic regression analysis.

After controlling the confounding effect of low dietary diversity score and household income, findings of this study indicated that the odds of having a stunted preschool child were twenty three (23) times higher if the household was food insecure. These findings were consistent using samples from Ghana children which found out that food insecure households had lower mean height-for-age [23]. Meanwhile, the association between chronic malnutrition was stronger in the 24- 36 months age group.

Moreover, these findings were consistent with research findings in rural Bangladesh and Colombia that showed significant association between food insecurity and malnutrition [24,25,26]. Moreover, research findings also suggested that after adjusting for all hypothesized confounding factors, moderate and severe food insecurity were significantly associated with stunting in Bangladesh, Vietnam and Ethiopia [19].

Influence of food security in stunting of preschool children can be affected by other determinants. In this study, ethno-linguistic classification, household family size, family income, support coming from the government were considered as confounding variables thus, these variables were controlled in this study. In this article, food intake adequacy and household income were found to be a significant confounder [20,27].

This was consistent with the result of other study which concluded that dietary diversity was significantly associated with stunting in all age groups. Compared with low DDS, high dietary diversity was associated with a 15, 26 and 31% reduced odds of being stunted [24].

Limitation of the Study

The difference in research findings between this study and other related studies was greatly due to difference in methodology and type of tool used. This research used Radimer- Cornell Tool of food insecurity while other related articles used the Household Food Insecurity Access Scale

(HFIAS) of the US Agency for International Development (USAID) which was designed to measure household food insecurity cross culturally [28].

The lower estimate produced by the study can be due to difference in sampling method used. Moreover, generalizability of data was limited to mainland municipalities and to household with preschool children enrolled in center- based day care centers. In addition, the prevalence of both household food insecurity and stunting provided wider confidence interval which can be explained by small sample size hence, the chance of having precise estimates was lowered. This could also explain the high odds ratio produced by this study.

Another limitation of this study can be attributed to seasonal variations, this study was carried out from October to November 2016 before the harvest period in Occidental Mindoro. The research findings were affected by recall bias due to the use of the 24- hour food recall as a reference for Dietary Diversity Score Questionnaire. Radimer- Cornell Tool also relies on memory of mothers and caregivers since it is based on past experiences. In terms of the 24- hour food recall, they might not be able to provide complete and accurate recall of food items even probing was done.

Lastly, the answers of the respondents might have been affected by social desirability bias. Mothers or caregivers might recall or answer the survey based from their perceptions on how they were adjudicated from the survey.

Conclusion

Magnitude of household food insecurity and stunting were found to be very high in the study areas. Although it was lower compared to the national estimates, it remained of public health significance. The significant association between household food security and stunting of preschool children implied that improving household food security is a potential strategy to improve the nutritional status of preschool children.

Food insecurity intervention program should be focused not only on food security programs but also on other nutrition programs such as home- based food production, livelihood programs for mothers and sustainable nutrition education programs. Furthermore, local leaders must support the implemented food insecurity intervention and nutrition program in order to make these programs more sustainable. Government must also conduct studies that can assess the effectiveness of the existing programs which focuses on solving hunger, health and malnutrition among preschool children.

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References

1. Trades Reforms and Food Security: Conceptualizing Linkages. Food Agriculture Office- Commission of Food Security. FAO: Rome 2003.
2. FAO, IFAD and WFP. The State of Food Insecurity in the World 2013. The multiple dimensions of food security. 2013. FAO: Rome
3. Facts and Figures. 8th National Nutrition Survey. 2013. Food and Nutrition Research Institute.
4. Ali Naser I, Jalil R, Wan Muda WM, *et al*. Association between household food insecurity and nutritional outcomes among children in Northeastern of Peninsular Malaysia. Nutrition Research and Practice. 2014; 8(3):304-311. doi:10.4162/nrp.2014.8.3.304.
5. Baig-Ansari N, Rahbar MH, Bhutta ZA, *et al.* Child's gender and household food insecurity are associated with stunting among young Pakistani children residing in urban squatter settlements. Food Nutr Bull. 2006;27:114–127.
6. Hackett M, Melgar-Quiñonez H, Alvarez MC. Household food insecurity associated with stunting and underweight among preschool children in Antioquia, Colombia. Rev Panam Salud Publica. 2009;25:506–510.
7. Social Weather Survey Result 2015. First to Fourth Quarter 2015 Hunger Result in the Philippines.
8. Eisenmann JC, *et al.* Is Food Insecurity related to overweight and obesity in Children and Adolescents? A Summary of Studies, 1995- 2009. 2013; Obes Rev. 2011 12 (5). E 73-83. doi: 10.111.1/s. 146- 789x. 2010.00820.x
9. Philippine Standard Geographic Code (PSGC). Philippines Statistics Authority 2016.
10. Radimer KL, Olson CM, Greene JC, *et al.* Understanding hunger and developing indicators to assess it in women and children. J. Nutr. Educ.1992; 24:36S-44S.

11. Ramirez MARM, Viajar RV and Azana GP. Construct Validity of an Adapted Radimer/Cornell Measure of Food Insecurity in the Philippines. BMJ Open 2015;5:bmjopen-2015-forum2015abstracts.76. doi: 10.1136/bmjopen-2015-forum2015abstracts.76
12. McDonald CM, McLean J, Kroeun H. Correlates of household food insecurity and low dietary diversity in rural Cambodia. Asia Pacific Journal of Clinical Nutrition 2015; 24(4): 720- 730.
13. Kirkpatrick S and Tarasuk V. Food security is associated with nutrient inadequacies among Canadian adults and adolescents. Journal of Nutrition 2008; 138(7) 1399.
14. Hoddinott JF and Yohannes Y. Dietary diversity as a food security indicator. International Food Policy Research Institute, Washington DC, 2002. Retrieved from http://orcid.org/0000-0001-7932-1816
15. Hatloy A, Halland J, Diarra M, et al. Food variety, socio- economic status and nutritional status in urban and rural areas in Koutiala (Mali). Public Health Nutr 2000; 3: 57-65.
16. Guidelines for measuring household and individual dietary diversity. Food Agriculture Office: Rome 2010.
17. Kennedy GL, Pedro MR, Seghieri C, et al. Dietary diversity score is a useful indicator of micronutrient intake in non- breast-feeding Filipino Children. Journal of Nutrition 2007; 137: 472-7.
18. Operation Timbang Plus Result. 2015 National Nutrition Council: Philippines
19. Ali D, Saha KK, Nguyen PH, et al. Household Food Insecurity is Associated with the Higher Child Undernutrition in Bangladesh, Ethiopia and Mediated by Child Dietary Diversity. Journal of Nutrition 2013; 143: 2015–2021.
20. Ajao KO, Ojofeitimi EO, Adebayo AA, et al. 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 / La Revue Africaine de la Santé Reproductive 2010; 4(4): 117-126.
21. Leonardo PdS and Denise PG. Relationship between Food Insecurity and Nutritional Status of Brazilian Children Under the Age of Five. Rev Bras Epidemiology 2013; 16(4):984–94.
22. Ghattas H. Food Security and Nutrition in the context of the Global Nutrition Transition. Technical Paper. FAO, Rome. 2014.
23. Mahama S and Osman SM. Does Household Food Insecurity Affect the Nutritional Status of Preschool Children Aged 6–36 Months?. International Journal of Population Research 2013; A304169, 2013-2025. doi:10.1155/2013/304169
24. Rah JH, *et al.* Low dietary diversity is a predictor of child stunting in rural Bangladesh. European Journal of Clinical Nutrition 2010; 64, 1393- 1398. doi: 10.1038/ejcn. 2010.171. (14)
25. Mehedi H, Sayem A, Atiqul HC. Food Insecurity and Child Undernutrition: Evidence from BDHS. Journal of Food Security 2011. 2013; 1(2):52–7. doi: 10.12691/jfs-1-2-7 (15)
26. Sheila I, Mercedes MP, Sandra LA, Ana B, Eduardo V. Food Insecurity Is Highly Prevalent and Predicts Underweight but Not Overweight in Adults and School Children from Bogota´, Colombia. The Journal of Nutrition 2007; 137:2747–55. (16)
27. Motbainor A, Worku A, Kumie A. Stunting Is Associated with Food Diversity while Wasting with Food Insecurity among Underfive Children in East and West Gojjam Zones of Amhara Region, Ethiopia. Public Library of Science 2015; 10(8): e0133542. doi.org/10.1371/journal.pone.0133542 (17)
28. Coates J, Swindale A, *et al.* Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide (v. 3) 2007. Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development.