

# Assessment of Malnutrition Prevalence Among Under Five Children Living in Sanmatenga Area of Burkina Faso, After the 2011-2012 Drought

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**Abstract:** In Burkina Faso, the malnutrition rate remains high according to the results of the various nutritional surveys carried out throughout the country since 2009. The children's nutritional state is characterized by an endemic malnutrition and the 2012 food crisis has led into an exacerbation of the acute malnutrition that mostly affects the children. The purpose of this study was to evaluate children less than five years with acute malnutrition in poor households affected by the 2012 food crisis in Sanmatenga province of Burkina Faso. The study conducted was retrospective based on the analysis of identified data of 4755 beneficiary poor households on a food security and livelihoods project that Non-Governmental Office (NGO) Save the Children International had implemented in Sanmatenga province in 2013 in response to the food crisis. The study showed that children under five in these poor households were severely affected by malnutrition. The global acute malnutrition rate according to mid upper arm circumference (MUAC) was 8.1% CI95 [7.6 – 8.6]. That high prevalence showed an important deterioration of the nutritional and food situation in these households following the food crisis. The results of the statistical analyzes revealed that the parent's place of residence, the household's size, the number of under five children and the household's poverty have a statistically significant negative impact on the malnutrition prevalence of 6 to 59 months old children in the poor households in Burkina Faso.

**Keywords:** Global Acute Malnutrition, Food Insecurity, Mid-Upper Arm Circumference, Poverty, Burkina Faso

## 1. Introduction

Malnutrition plays a significant role in child and infant mortality, with eight million child deaths annually [1]. Around 13 million of children were born with intrauterine growth retardation, 112 million suffer from an underweight and 178 million of children under five suffer from stunting in the world. The majority of these children live in the South of Central Asia and in the sub-Saharan Africa where food insecurity is frequent [2].

The severe food crises period of 2006, resulted in 39 countries in the world of which 25 were in Africa, 11 in Asia

and the Middle-East, two in Latin-America and one in Europe. This resulted in critical food shortage, across those countries which had to depend on foreign food aid [3]. During that period, West Africa registered the highest poverty rates in the world. According to the 2011 report on the Millennium Development Goals (MDG), 51% of the sub-Saharan Africa population suffered from poverty [4]. In 2011, sporadic rains, insufficient harvests and the rise of food prices caused wide spread food insecurity among populations of the Sahel countries. More than 10 million people suffered from food insecurity challenges while about one million children suffered from severe acute malnutrition [3].

In 2012, Burkina Faso experienced high prevalence of severe malnutrition and food insecurity among children under five. The reports of the General Directorate of Promotion and Rural Economy (GDPRE), Food and Agriculture Organization (FAO), Farming Early Warning System Network (FEWS NET), and the World Food Program (WFP) revealed that around 2.8 million people suffered from severe food insecurity. One hundred and seventy (170) communes (out of 356) have been identified with a food insecurity risk [5]. In this context, most of the impoverished and vulnerable populations couldn't ensure their needs in food due to the low food supplies and the difficult access to food products exacerbated by high prices.

In a food crisis context, the evaluation of the nutritional and food situation is important because it provides important information about the nutritional and food status in the households and enables one to evaluate the gravity of the crisis [6]. Several studies have shown that the malnutrition prevalence is generally higher in the poor households, especially during crisis [6-8]. Some studies have shown that the malnutrition has been linked to the households' socio-demographic and economic factors such as the parents' level of education, the religion, the family's location, place of residence, the mother's job, sanitation, the marriage settlement, the household's size, the number of under five children, the gender of household's head and poverty [7-9].

The in-depth evaluation of World Food Program (WFP) and General Directorate of Promotion and Rural Economy (GDPRE) helped to have an insight of the food security in the most affected areas but limited specific information have been available on the nutritional situation in these areas. Likewise, few data of a comparative study on the malnutrition situation in the households of the most vulnerable Socio-Economic Groups (SEG) defined by the Household Economy (HEA) Analysis have been available. In this context, this study has been carried out in Samatenga area and its general objective consisted of the evaluation of the acute malnutrition situation of under five children of the "Poor" and the "Very Poor" households affected by the 2012 food crisis in Burkina Faso.

The specific objectives of this study was to determine the prevalence of the Global Acute Malnutrition (GAM) under five children in the vulnerable households affected by the drought and to establish a correlation between the GAM's prevalence and the socio-demographic and economic features of these poor households in food insecurity situation.

## 2. Methods

### 2.1. Study Area, Population and Demographics

It was a retrospective study carried out in the province of Sanmatenga in Burkina Faso, located 100 kilometers north of Ouagadougou with an area of 9 419 km<sup>2</sup> and a population of estimated in 2012 at 704 021 inhabitants [10]. The province's economy is based on agro-pastoral activities, arts and crafts and the mining and forestry exploitation. The

agricultural activities suffer from unfavorable climate conditions which make the nutritional and food situation precarious with more than 24% of the population in severe food insecurity in 2012 [11].

The study has been carried out specifically in the intervention area of the project "Emergency Nutrition and Livelihoods Assistance for Drought Affected Families in Centre Nord region, Burkina Faso" implemented by the Non-Governmental Office (NGO) Save the Children International (SCI) in response to the food crisis in this-area. The household was the basic unit of the study and is defined as a group of people usually living together, sharing the same resources together and hence the authority comes under one person called the head of the household [12]. The study's sample was made up of 4755 vulnerable households identified in six communes of the province (Boussouma, Kaya, Mané, Namissiguima, Pibaoré and Ziga) in 2013.

### 2.2. Data Collection

The concerned population amongst which the study was conducted was children under five in these vulnerable households. The other members of the households also took into account in the study for some analyzes. The study's databases have been directly collected from information based on the identification of these beneficiary poor households of the SCI's intervention. The identification of the households took place from April to May, 2013. The collected data have been related to the global acute malnutrition (GAM) which represents the prevalence of moderated acute malnutrition (MAM) and the severe acute malnutrition (SAM) in a population. The MAM is identified as being a moderated emaciation of which the index Weight for height Z-score (WHZ)  $< -2$  z-score and  $\geq -3$  z-score for the children under five or Mid-Upper-Arm Circumference (MUAC)  $\geq 115$  mm and  $< 125$  mm for children of 6-59 months old. The SAM is identified as being a severe emaciation of which the index WHZ  $< -3$  z-score for the children aged less than five years or MUAC  $< 115$  mm for the children of 6-59 months, or the presence of bilateral oedema taking the cup [13]. The Measuring MUAC has been the main criterion used during the screening of children's malnutrition identification at the household's level. The MUAC is a measure of the arm at mid-distance between the acromion and the olecranon process; it is a better indicator for the mortality risk associated with the malnutrition [13].

### 2.3. Data Processing and Analysis

The households' socio-demographic and economic variables are collected as follows: the household's size in population, the age and gender of the head of the household's, the number of wives and daughters, the number of under five children, the number of children aged from 5 to 16 years, the number of animals, the household's other commodities, (plows, carts, bicycles,...) and the number of the household's children suffering from acute malnutrition. For statistical analysis, Statistical Package for

the Social Sciences (SPSS) was the software used and it's consisted on descriptives and multivariate analyses with the index «nutritional situation» as dependent variable (presence of undernourished children in the household). The Chi-Square ( $X^2$ ) test was used to prove the significance of the association between malnutrition and household's socio-demographic and economic variables by descriptive analysis at the threshold of 5%. As for the logistic regression, it allowed for the determination of explanatory factors of children's malnutrition. It also enabled the search for factors significantly influencing the «nutritional situation» and to measure the effects of each of them. When there is association between the statistical model and nutritional situation, socio-demographic and economic variables the Chi-Square test was used and the Pearson R values measured the strength of their correlation. Furthermore, the coefficient of Pearson R values was used to appreciate linear correlation between variables while HEA criteria were used to categorize the Socio-Economic Groups (SEG) among the households. According to these criteria the classification was as follow:

- *SEG of the "Very Poor"*: it gathered the households of which the size was from 4 to 7 people, the number of children younger than 16 years old generally varied between 3 to 5 with few or no children under five (0 to 2). These households have had few or no animals (some livestock and poultry). They had few active members (2 to 3) and exploited small agricultural lands of 1 to 2 Km<sup>2</sup>
- *SEG of the "Poor"*: This stratum gathered households of relatively higher size. Their size varied between 8 to 13 people, the number of under 16 children was from 6 to 9 with 3 to 5 children under five. These households

had a small animal husbandry of 4 to 6. The number of active members nevertheless remained limited (3 to 4) and was mainly made up of women, their farming exploitations varied from 3 to 4 Km<sup>2</sup>

- *SEG of the "Medium"*: It mainly was the great size-households, higher than 13 people. The number of children was very important and varied from 9 to 11. These households worked agricultural lands going from 4 to 5 Km<sup>2</sup> and have practiced a small livestock of 6 small ruminants. It certainly concerned medium income households, but which have been hard hit by the drought of the 2011-2012 farming campaign. These households have been least represented in the study's sample.

#### 2.4. Ethical Considerations

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and the Burkina Faso Ethical Guidelines for Research and data were collected closely with SCI that is an international NGO authorized by government to work with local populations.

### 3. Results

#### 3.1. Socio-demographic and Economic Characteristics of the Study's Households

More than half (52.7%) of the responded were female and 47.3% were male. These proportions are comparable to the national gender trend (52% of female and 48% of male) according to the National Institute of Statistics and Demography (NISD) in 2011 [14].

Table 1. Socio-demographic and economic characteristics of households in the study.

Communities	Households identified number			Households population size		
	Households headed by men number	Household headed by women number	Effectives	Accumulated effectifs	Men's number	Women's number
Kaya	477	503	980	8362	4172	4190
Boussouma	764	360	1124	9933	4786	5147
Ziga	570	154	724	6898	3023	3875
Pibaoré	613	287	900	7996	3539	4457
Mané	402	130	532	3962	1976	1986
Namissiguima	273	222	495	4390	2156	2234
Total	3099	1656	4755	41541	19652	21889
Percentage	65.20%	34.80%			47.30%	52.70%

Table 1. Continued.

Communities	Households population size			Livelihoods		
	Children under 5 years number	Children from 5 to 16 years number	Active persons number	Malnourish children number	Cultivated area (Km <sup>2</sup> )	Livestock heads number
Kaya	1899	2881	2972	96	2262.25	1951
Boussouma	2158	3129	4057	160	1632.8	3633
Ziga	1898	2108	2497	119	1180.8	2683
Pibaoré	1796	2738	2871	188	1560.3	2687
Mané	1457	1112	1650	146	821.8	1571
Namissiguima	866	1585	1600	110	694.1	1577
Total	10074	13553	15647	819	8152.05	14102
Percentage	24.20%	32.60%	37.70%			

The above table shows that about 34.8% of the identified households are led by women while 65.2% are led by men. 15 647 active people work to feed a population of 41 541 people, corresponding to a production capacity of around 37.7%. The average age of the house heads was 59 years, which shows that these households were headed by elderly people whose physical production abilities are weakened due to advanced age. The children younger than 15 years old (who are inactive) represented more than 56.8% of the study population.

The agricultural area was estimated at around 8152.05 Km<sup>2</sup> and the livestock at about 14 102 heads of cattle, included all species of the animals. For a medium size of 9 people, the average agricultural exploitation per household was of 1.71 Km<sup>2</sup>, the average livestock had been 3 heads of cattle per household. This low area of exploitation shows that these households have little access to farming lands and/or they do not have enough active members to exploit the areas they possess.

These households' very little limited means of existence (1.71 Km<sup>2</sup> and 3 heads of cattle for a household of 9 people) convey to their high vulnerability and their inability to resist for a period to shocks like the drought of the 2011/2012 agricultural campaign.

### 3.2. Prevalence of the Global Acute Malnutrition (GAM) in the Households

The GAM's rate of children is one of the most important nutrition indicators in identifying and evaluating the scale of humanitarian crisis. Acute malnutrition is positively related to increased risk of diseases, from which deductions can be made regarding access to food, adaptation mechanisms, the functioning of the public health system, the status of Water Hygiene Sanitation (WASH) and the level of resilience [6].

The GAM's prevalence in the present study was 8.1% CI<sub>95</sub> [7.6 - 8.6]. This prevalence reflects on one hand the children's nutritional status and on the other hand the consequence of an insufficient nutrition during the period prior to the observation or the consequences of diseases that cause loss of weight (severe diarrhea and anorexia).

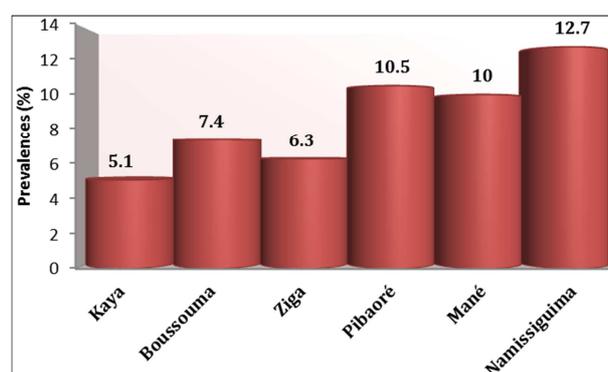
Food insecurity and poverty were identified as underlying and fundamental causes of malnutrition. Good nutrition starts with sustainable access to adequate and qualitatively food products for a healthy life.

**Table 2.** Significance of dependency between child malnutrition and socio-demographic and economic characteristics of households.

Dependent Variable: nutritional status of children in the household		
Independent variable	Pearson R value	Asymptotic significance (P-value)
Place of residence	0.241	0.000
Household size	0.277	0.000
Age of household head	0.054	0.771
Sex of household head	0.137	0.003
Women + female children	0.171	0.000
Children under 5 number	0.239	0.000
Number of children from 5 to 16 years	0.088	0.189
Number of children under 16	0.170	0.036
Number of active persons	0.112	0.000
Animals number	0.142	0.000
Socio-economic group	0.209	0.000

### 3.3. Malnutrition Prevalence According to the Communes

Three of the six communes of the study have shown prevalence of an acute malnutrition higher than 10% which are the critical threshold of the WHO showing a severe endemic (Mané, Namissiguima and Pibaoré). These high prevalence might form indicators of a more important deterioration of the food, sanitary and hygienic situation of these communes. The commune of Namissiguima has shown the highest rate of malnutrition which was 12.7% CI<sub>95</sub> [10.5- 14.9]. This high prevalence might especially be linked to the socio-economic and sanitary level of the commune. As a matter of fact, it is one of the most remote communes of the province. It is 80 km to the province's administrative center and very hard to get to especially in rainy seasons which coincide with the wedding period, because of the poor quality of the road infrastructures. Its population which benefits very little from NGO's and associations' interventions is always confronted with the harmful consequences caused by the repetitive cereals shortage and its inaccessibility in rainy season [15].



**Figure 1.** Malnutrition prevalence according to the communes.

### 3.4. Correlation Between Malnutrition and the Household's Socio-demographic and Economic Characteristics

The results from the cross-tables involving statistics of Chi-square and the coefficient of Pearson's correlation @ reveal the links between the children's nutritional state and the vulnerable households' socio-demographic and economic variables have been highlighted.

The table 2 shows that the significance of dependences between the children's nutritional state and the households' socio-demographic and economic variables.

### 3.5. Malnutrition and Households' Socio-demographic and Economic Variables

The malnutrition situation was more correlated with some socio-demographic and economic variables used in the analysis.

The results of the bivariate analysis have allowed observing an important variation of malnutrition rates between the rural and urban areas. In the rural area, the malnutrition rate was 8.8% CI<sub>95</sub> [6.3 – 10.1] whilst in the urban area, the rate was only 5.1% CI<sub>95</sub> [3.3 – 6.0]. Children whose parents were living in the rural area have then been most affected by malnutrition than these whose parents were living in the city. The Chi-square test shows that that difference is significant at the threshold of 5%.

On the variable «group of the head of the household's age», it came up that the children from the households being run by elderly people (50 years and more) have been the most affected by malnutrition than these from the households of which the head was young. The Chi-square test (Table 2) notwithstanding has shown that the group of the head of the household's age hasn't significantly been linked to the malnutrition rate of children five under in the household.

The analysis of the malnutrition prevalence according to the head of the household's gender has clearly shown that the malnutrition rate has been lower in the households run by women than in these run by men (6.1% to 10.7%). The malnutrition rate of the households run by men has reached the WHO's critical line showing a severe endemic (10%). The bivaried analysis has also shown that the head of the household's gender has been associated with the children's nutritional situation in the household at the threshold of the 5%. Nevertheless, the value of Pearson R (0.137) has shown that the linear connection intensity has been weak.

The total number of people in the households is also an important variable in the occurrence of malnutrition. The malnutrition rate has been in decrease for a household of less than 5 people to increase from households of 9 people and more. The Chi-square test (Table 2) has shown significance

at the threshold of 5% between the children's nutritional situation and the number of people in the household. The value of Pearson R has shown a higher linear connection intensity between the children's nutritional situation and the household's size (R = 0.277) in relation to the other variables.

Just like the household's size, the number of children under five is also a determining factor of malnutrition. The study has shown that children from households where the number of children under five was more than 4 have suffered mostly from malnutrition (12.1%) than these from the households where the number was lower than 3 children (4.1%). The test of significance has shown that the number of children under five in the household has been associated with the malnutrition rate with the children at the threshold of 5%. The value of Pearson R has also shown a non-negligible degree of linear connection between the nutritional situation and the number of children younger than 5 years old (R = 0.239).

Concerning the correlation between malnutrition and the households' SEG, the study has shown that the malnutrition rates have been higher with the children of the households' SEG of the «*Very Poor*» and the «*Poor*». The malnutrition rate in the households' SEG of the «*Poor*» (11.7%) has also been higher than the households' SEG of the «*Very Poor*» (9.2%). The difference within the three SEG has significantly been at the threshold of 5%.

Within the above analyzed socio-demographic and economic determinants of the acute malnutrition, it came out that the place of residence, the household's size; the number of children under five and the household's SEG form the variables having more significant effects on the children's malnutrition. The children from big size households (10 people and more) run twice the risk of malnutrition than these from the small size households. The risk of falling into malnutrition was higher if the number of children under five was more important in the household (4 children and more). The analysis also showed that the children from the households' GSE of the «*Poor*» presented more risk of malnutrition than these of the GSE of the «*Very Poor*». The children of the households' GSE of the «*Medium*» were less exposed than the others.

Table 3. Malnutrition and socio-demographic and economic characteristics.

Malnutrition according to MUAC		
Variables	Normal state (MUAC ≥ 125 mm)	Malnourished (MUAC < 125mm)
Place of residence		
Rural area	91.2% CI <sub>95</sub> [89.2 – 93.3]	8.8% CI <sub>95</sub> [6.7 – 10.8]
Urban area	94.5% CI <sub>95</sub> [93.2 – 95.2]	5.5% CI <sub>95</sub> [4.2 – 6.8]
Household head age group		
15 to 29 years	93.8% CI <sub>95</sub> [92.0- 95.7]	6.2% CI <sub>95</sub> [4.3 – 8.0]
30 to 49 years	91.8% CI <sub>95</sub> [89.1 – 94.5]	8.2% CI <sub>95</sub> [5.5 – 10.9]
50 to 64 years	89.5% CI <sub>95</sub> [86.3 – 92.8]	10.5% CI <sub>95</sub> [7.2- 13.7]
Aged 65 or older	89.9% CI <sub>95</sub> [86.6 – 93.3]	10.1% CI <sub>95</sub> [6.7 – 13.4]
Household head sex		
Male	89.3% CI <sub>95</sub> [87.8 – 90.9]	10.7% CI <sub>95</sub> [9.1 – 12.2]
Female	93.9% CI <sub>95</sub> [92.5 – 95.2]	6.1% CI <sub>95</sub> [4.8 – 7.5]
Malnutrition and household size		

Malnutrition according to MUAC		
Variables	Normal state (MUAC $\geq$ 125 mm)	Malnourished (MUAC < 125mm)
< 5 people	95.5% CI <sub>95</sub> [94.3- 96.7]	4.5% CI <sub>95</sub> [3.3 – 5.7]
5 to 9 people	89.6% CI <sub>95</sub> [86.8 – 92.5]	10.4% CI <sub>95</sub> [7.5 – 13.2]
10 people and more	88.6% CI <sub>95</sub> [86.7 – 90.8]	11.4% CI <sub>95</sub> [9.2- 13.3]
Malnutrition and <5 years number		
< 3 children	95.9% CI <sub>95</sub> [94 – 97.9]	4.1% CI <sub>95</sub> [2.1 – 6.0]
3 to 4 children	91.1% CI <sub>95</sub> [86.3 – 95.7]	8.9% CI <sub>95</sub> [4.3 – 13.7]
More than 4 children	87.9% CI <sub>95</sub> [85.2 – 90.8]	12.1% CI <sub>95</sub> [9.2 – 14.8]
Malnutrition and socio-economic group		
«Very poor»	90.8% CI <sub>95</sub> [86.8 – 94.6]	9.2% CI <sub>95</sub> [5.4 – 13.2]
«Poor»	88.3% CI <sub>95</sub> [85.3 – 92.2]	11.7% CI <sub>95</sub> [7.8 – 14.7]
«Middle»	95.6% CI <sub>95</sub> [93.3 – 97.9]	4.4% CI <sub>95</sub> [2.1- 6.7]

Table 4. Report of risks regression acute malnutrition according to the MUAC.

Reference category	Modality variable	Odds ratio
Urban	Rural	1.778
Household size		
< 5 people	5-9 people	2.463
	10 people and more	2.730
Children under 5 years number		
< 3 children	3 to 4 children	2.285
	More than 4 children	3.211
Household socio-economic group		
«Very poor»	«Poor»	1.306
	«Middle»	0.454

## 4. Discussions

The acute malnutrition rate is an important indicator in the identification and evaluation of a humanitarian crisis. The study has shown that the acute malnutrition rate according to MUAC in the concerned poor households by this study was 8.1%. This prevalence represented almost the double of the national level's own of the acute malnutrition. Indeed, the GAM prevalence according to MUAC was 4.8% in Burkina Faso in 2012 [16]. The households' poverty and the place of residence make up the variables having significant effects on the children's malnutrition [7].

In addition to the poverty and the food insecurity that the households have been going through, there also is potential factors like the poor hygiene and sanitation conditions and the low level of education (18.7% for the males and 11.5% for the females) likely to influence the children's state of nutrition of these vulnerable households. Living in a continual poverty state, these households have very little access to health care service, hygiene, sanitation and drinking water. In fact, the survey's results of the General Directorate of Wastewaters and Excreta Sanitation (GDWES) (2010) on the bad hygiene and sanitation conditions in the area have shown that nearly 84.8% of the populations of the zone defecate in the nature and 85% have no access to tap water and the water from drillings and wells has not been going under any preliminary treatment before drinking; only 30% of the households have put their garbage in a hole, 53% have piled them up outside their compound and 17% inside the yard [17].

Moreover, a study in the area on the efficiency of the ambulatory care of malnourished children in the district of Kaya has shown that the frequency of meals is insufficient (2 meals per day) in nearly 77% of the households in the zone

[18]. Another study has also shown that the number of meals per day for the children varied from 2 to 3 meals and these meals have rather been stuffing than nutritive [19]. The whole of these factors might then make the children of these households more fragile and expose them the more to malnutrition, and that risk is increasingly high in times of food insecurity like the 2012 food insecurity that has hit the region.

Concerning the link between malnutrition and the head of the household's group of age, the results have shown that the rates are likely to increase with the head of the household's groups of age. These results have been corroborated by another study that showed the development of the malnutrition rate in the households run by elderly people (64 years and more) [7]. However, a study conducted in Niger indicated that the malnutrition rates have been higher in the households run by people younger than 35 years old and these rates have decreased from 50 years [20]. The average age of the heads of the households of the study has been 59 years. This shows that these households have mostly been run by elderly people whose physical production abilities have been weakened due to the advanced age. The Emergency Food Security Assessment (EFSA) of the World Food Program (WFP) in Burkina Faso in 2012 have formerly shown that the prevalence of the food insecurity has been higher with the heads of the households of more than 58 years old and might well emphasize the malnutrition rates in these households [5].

The household's size is also an important factor in the occurrence of malnutrition. The study's results have shown that at a statistical significance at the threshold of 5%, he more the members of the household, the higher the malnutrition rate with the children under five: the households with more than 8 people have noticed high malnutrition

prevalence (table 3). This result has been corroborated in the literature [7, 8, 21]. Nevertheless, studies have shown that that difference did not seem significant [22, 23]. The reference [24] has shown that there has been dependence between the malnutrition prevalence and the household's size. According to the National Survey on Food Insecurity and Malnutrition (NSFIM) of the General Directorate of Promotion and Rural Economy (GDPRE) (2009), in the rural area, the household's size in population formerly being considered as labor is an impediment to the household's food security. The big size households have had 2.5 to 4.5 times of risk of being in food insecurity state in relation to the smaller size households [25]. For most of these households, the food purchases represent more than half of their domestic expenditures. This creates higher level of risk in case of an increase in prices or the instability of markets, because they have little or no flexibility in their budgets to meet the rise of prices especially during the wedding period [26]. The number of children under five in a household shows the ability of the latter in facing the nutritional and food needs. Indeed, the study's results presented in table 3 have shown that the children from households of which the number of children under five was more than 4 have been suffering mostly from malnutrition (12.1%) than these from the households of which the number of children was lower than 3 (4.1%). This result is has been proven by a study conducted in Togo in 2014 [21]. The reference [9] have also drawn conclusions that the link between the number of children and nutrition has evolved as time goes by because the situation has been degrading when the number of children increase without the elderly people being able to work again.

The study has also shown that the malnutrition prevalence has been linked to the head of the household's gender and the children from the households run by men have been severely affected by malnutrition (10.7%) than the households run by women (6.1%) (table 3). This result has been proven in [8] and [27]. The references [7] and [21] have found out the opposite, whereas [22] has reported that malnutrition has prevailed likewise with the children under five in Chad without exception of the households according to the head's gender. From the analysis of poverty and food insecurity in the households, the National Survey on Food Insecurity and Malnutrition (NSFIM) of the GDPRE (2009) has shown that the households run by women have been mostly vulnerable than these run by men [25]. In fact, women heads of the households are generally widows who inherit very little goods from their late husband's due to the fact that they are always seen as «strangers» [12]. They also have little access to the productive resources (lands, loans, etc.), which limits their ability to increase the food supply in the household and increases their vulnerability [25]. The analysis of the malnutrition prevalence in the households shows in this case an opposite situation to the vulnerability's one. Several factors are liable to explain this situation. The households' socio-demographic study has shown that the average size of the households run by men was 10.2 people while it was 6.8 in the houses run by women. The high malnutrition

prevalence in these households run by men might thus be linked to the important size of these households, but also due to the fact that the risky population (children under five) is much more important in these households. Moreover, in these households, some socio-cultural burdens can often limit the women's access to health centers. According to a Red-Cross's study (2009), 21% of women in the rural area said to have repeatedly been forbidden by their husbands to go with their children to a health center [28]. The whole of the above mentioned factors and practices in these households can then sometimes influence the children's state of nutrition and food. Most often, even if the malnutrition is due to the combination of several factors, we might also think that when a woman has an accrued decision-making power, particularly on the children's health, this can only be beneficial and contributes to an improvement of the children's nutritional and health state.

Within the malnutrition determining factors, the socio-economic level has also a very important influence. Thus, the study's results have shown that the children of the household's GSE of the "Poor" and the "Very Poor" have been the most hit by malnutrition (table 3). The malnutrition rate in the "Medium" households (4.4%) has been so close to the national level's own in 2012 which was 4.8%. These households have been the least represented in the study's sample. Several studies have shown that malnutrition has mostly affected the children in the poor households than these from the medium and wealthy households. References [29] and [30] have shown that there is a link with a significant difference, between malnutrition and the household's socio-economic level. The reference [21] has shown that the households' living conditions especially the index of poverty has been a cause of the infant's malnutrition. Another study have also got to the same conclusion that the prevalence of skinniness with the children younger than 5 years old in the poor households has been higher than the one being observed with the children in the wealthy households as well in Burkina Faso as in Chad [8].

The study's results show nevertheless that there is a difference of prevalence within the poor households. The children of the household's GSE of the "Poor" are mostly hit by the malnutrition than these of the GSE of the "Very Poor" (table 4). The malnutrition rate with the "Poor" (11.7%) reaches more than the double of the provincial and national prevalence of the same year (4.8% and 5.1% respectively). On the socio-economic level, these two groups of households are very close and experience almost the same way the food insecurity situations. However, in view of the socio-demographic characteristics of the households' GSE of the "Poor", several factors are liable to influence the children's state of nutrition of these poor households which size is relatively high, especially in times of food shortage. Despite the small size of their agricultural exploitation, these households must meet all their needs (food and non-food) with their harvests or their small livestock. Following the bad harvests of the 2011-2012 farming campaign recorded in the zone, the cereal production being in deficit, the level of the

cereals prices has significantly risen since January 2012 [31]. These big size “*Poor*” households (10 people in average) have so hard been impacted because of the great number of people to feed with their limited incomes. They have been in majority made up of women and children, the number of active members is most often reduced and the husbandry is limited to a few small ruminants which are straight away sold in difficult times. This situation thus makes their savings more fragile facing the drought and food insecurity situations.

In spite of the reduced size of the household’s SEG of the “*Very Poor*”, these households cannot meet their basic food needs, even during the good rainy years, because they only have few or no active members liable to work [26]. This SEG is then the most exposed to food insecurity and their means of survival are particularly limited with the lack of incomes. Nevertheless, this low prevalence in relation to the “*Poor*” households’ might especially be linked to the fact that these small size households generally have few or no children younger than 5 years old who are the malnutrition targets. When there are fewer children, the households manage even most often during difficult periods to meet their basic food needs and medical care [32].

## 5. Conclusion

The global acute malnutrition prevalence according to MUAC in the poor households hit by the food crisis has been nearly the double of the national level’s own given by the Direction of Nutrition in 2012. The higher malnutrition prevalence in the poor households in relation to the other SEG by several authors and international bodies has then been strengthened by this study.

Concerning the socio-demographic and economic factors having an influence on malnutrition, it has been accepted that the place of residence, the household’s size, the number of children under five, the head of the household’s gender and the household’s state of poverty have a statistically significant negative impact on the malnutrition prevalence of children from 0 to 59 months old in the poor households of Burkina Faso.

In view of the acute malnutrition in the vulnerable households on which the current study has been carried out, it is vital that a specific study on food, nutritional and care practices should be carried out so as to implement sustainable action plans for preventing malnutrition in these households during the most difficult times.

## Authors Contributions

Ouédraogo Somketta Emmanuel and Bengaly Marcel conceived and designed the study. They also participated for data collection, input, design of tables and analysis. Ouédraogo Somketta Emmanuel, Compaoré Ella wrote and did the zero draft of the paper. Compaoré Ella, Pietra Virginio, and Francis Zotor did the critical revision of the article and also finalized the revision after the final approval by Traoré Alfred of the paper for submission and subsequent

follow-up to get the paper published. All authors approved the revised manuscript.

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